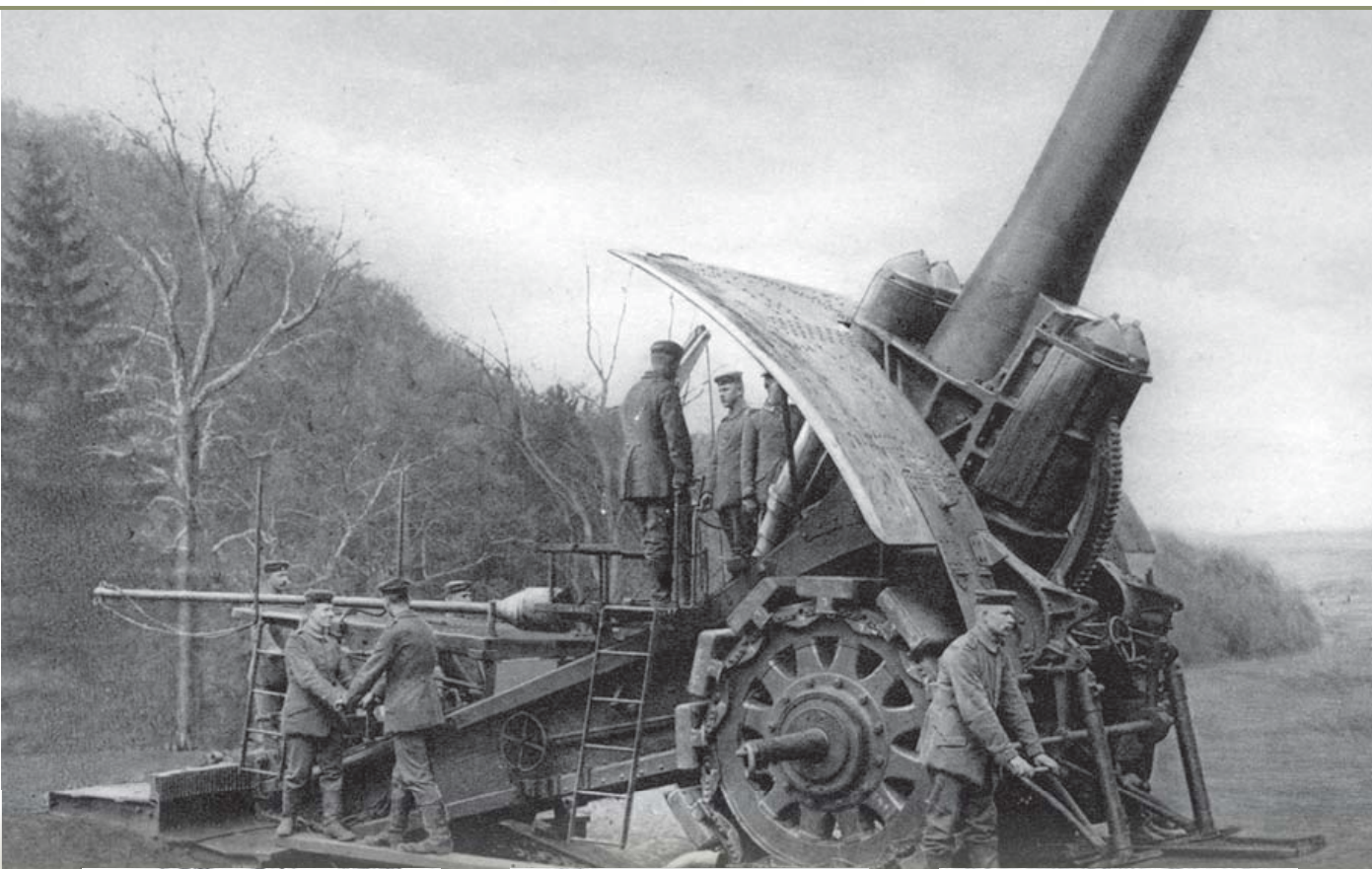


42CM "BIG BERTHA" AND GERMAN SIEGE ARTILLERY OF WORLD WAR I



M. ROMANYCH & M. RUPP

ILLUSTRATED BY H. MORSHEAD

NEW VANGUARD 205

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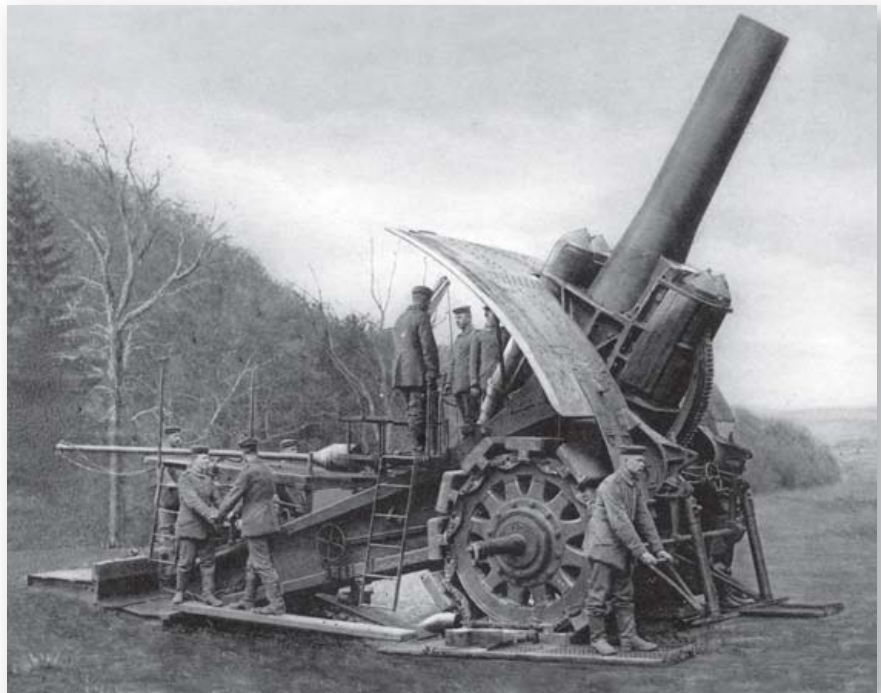
42CM “BIG BERTHA” AND GERMAN SIEGE ARTILLERY OF WORLD WAR I

INTRODUCTION

In the first days of World War I, Germany unveiled a secret weapon – the mobile 42cm (16.5 inch) M-Gerät howitzer. At the outbreak of the war, two prototype guns were rushed from the factory where they were still undergoing pre-production modifications to the Belgian fortress of Liège. There, they handily demolished two of the forts; one of which – Loncin – blew up in a catastrophic explosion, effectively ending the siege. Jubilant, German soldiers christened the guns “*Dicke Berta*” (Big or Fat Bertha), possibly after Bertha von Krupp, owner of the firm that built the howitzers. Soon after, German newspapers picked up on the nickname and the legend of “Big Bertha” was born.

Shrouded in secrecy, the existence of mobile 42cm howitzers came as a shocking surprise to the Allied Armies. After Liège fell, wild rumors circulated about the guns, and the name “Big Bertha” was commonly used to

At the war's start, the German Army had only two prototype 42cm M-Gerät “Big Bertha” howitzers, both of which were undergoing pre-production modifications. The spoke wheel of the howitzer in this German propaganda photograph indicates that it is one of the prototype guns. (M. Romanych)





A battery of 21cm howitzers prepared for action. Both Belgium and France designed their fortifications to withstand hits by 21cm projectiles, not realizing that the German Army would develop larger caliber mobile siege guns. (M. Romanych)

refer to any large-calibre German artillery piece. Misinformation flourished and the mythology of “Big Bertha” grew, spawning several falsehoods that live on to this day in English-language histories of the war.

FORTIFICATIONS VERSUS ARTILLERY

During the last half of the 19th century, advances in artillery technology and design prompted an “arms race” between artillery manufacturers and fortification engineers. Introduction of breechblocks, recoil mechanisms, and rifled barrels led to a new generation of field guns and howitzers with greatly improved range and accuracy. In response, military engineers completely redesigned permanent fortifications, abandoning large, star-shaped “Vauban-style” bastioned forts in favor of smaller, polygon-shaped forts. Depending on terrain, these forts were often grouped together into ring-fortresses and fortified barriers. Ring-fortresses consisted of several forts arranged in a circle around a city at a distance sufficient to keep enemy artillery out of range of the city (typically about 12 kilometers). Fortified barriers were groups of forts either clustered together to secure a strategic point or arrayed in a line to block an invasion route. In France, ring-fortresses and fortified barriers were combined to create expansive fortification zones.

A second technological advance was the replacement of black powder with more powerful high-explosive propellants and bursting charges. This development led to a new generation of shells equipped with delay fuses that multiplied heavy artillery’s firepower against fortifications. Fielding of these improved munitions prompted another round of fortress construction. Fortress engineers hardened existing fortifications by reinforcing or replacing masonry with concrete, covering portions of the forts with earth, adding underground galleries and shelters, and relocating artillery from open ramparts into armored casemates and rotating steel turrets. Completely new fortifications were also designed and built. These so-called “armored” fortifications resembled land-locked battleships and were essentially large fortified artillery batteries purposely designed to defend against artillery bombardment rather than infantry assault.

By the turn of the 20th century, the borders shared by France, Belgium, and Germany were heavily fortified. France's fortifications were by far the most extensive with ring-fortresses at Lille, Maubeuge, Verdun, Toul, Epinal, and Belfort connected by barrier forts into several fortress zones. The capital, Paris, was a fortress protected by a double ring of 41 forts. Likewise, Belgium had ring-fortresses at Liège and Namur, and Antwerp was turned into a national redoubt surrounded by some 50 forts and other smaller fortifications arranged in two concentric rings. For its defense, Germany had two modern fortress zones: one around Metz and Thionville in Alsace and another at Strasbourg in Lorraine. Older fortifications guarded Rhine River crossings at Wesel, Cologne (Köln), Koblenz, Mainz, Germersheim, Neu Breisach, and Istein.

Eastern Europe was also well fortified. Germany had fortified zones in East Prussia at Königsberg (Kaliningrad) and Lötzen (Giżycko) and a series of ring-fortresses along the Vistula, Warthe, and Oder rivers at Danzig (Gdańsk), Marienburg (Malbork), Graudenz (Grudziądz), Thorn (Toruń), Posen (Poznań), Küstrin (Kostrzyn), Glogau (Głogów), and Breslau (Wrocław). Germany's ally, Austria-Hungary, fortified its border with Russia with ring-fortresses at Cracow, Przemyśl, and Lemberg (Lvov). Its border with Italy was defended by a line of barrier forts in the Alps. Russia maintained large ring-fortresses in Lithuania at Kovno (Kaunas) and Grodno, and in Poland at Osowiec, Novogeorgievsk (Modlin), Warsaw, and Ivangorod and a number of barrier forts in between the fortresses to block river crossings. Deeper inside Russia were fortresses at the strategic points of Dvinsk (Daugavpils) and Brest-Litovsk.

DESIGN AND DEVELOPMENT

After winning the Franco-Prussian War, the German Army dismissed the utility of heavy artillery, even though heavy guns had successfully reduced French forts during the sieges of Metz, Strasbourg, and Toul. So strong was the sentiment, that artillery was separated into two branches – the *Feldartillerie* (field artillery) with mobile, light field cannons and the *Fußartillerie* (foot artillery) with heavy mortar and howitzer pieces. Priority was given to the field artillery while foot artillery was allowed to languish.

Priorities changed in the 1880s, when Chief of the General Staff Generalfeldmarschall von Moltke demanded an artillery solution to what he termed the “fortress dilemma.” As he saw it, new permanent fortifications built by France, Belgium, and Russia were hemming in Germany. In a future war, Germany would have to attack and destroy these fortifications. However, the army's largest artillery pieces were the foot artillery's aging 15cm and 21cm pieces, which could not destroy modernized French and Belgian fortifications; hence the dilemma.

The situation grew serious for Germany when France and Russia signed a military alliance in 1893. This meant that in the event of war, the German Army would likely fight both countries simultaneously. In response to the possibility of a two-front war, new Chief of the General Staff, Generalfeldmarschall von Schlieffen, developed a strategy to defend against Russia while attacking France. A key and unsolved component of his plan was the quick reduction of fortifications that blocked invasion routes into France. Lacking any means to destroy the fortifications, the General Staff turned its attention to large-caliber siege artillery as a solution.

Basic Siege Gun Data							
	28cm L/12 i.R. & L/14 i.R.	30.5cm Beta- Gerät	30.5cm Beta- Gerät 09	30.5cm Beta i.R.	30.5cm Beta-M- Gerät	42cm Gamma- Gerät	42cm M-Gerät
Weight (metric ton)	17	30	45	24.5	47	150	42.6
Weight of Heaviest Projectile (kilograms)	285	410	410	330	345	1,160	800
Rate of Fire (rds/hour)	15	15	12	12	8	8	8
Maximum Range (meters)	9,700	8,200	12,000	12,000	20,500	14,000	9,300
Time to Emplace (hours)	3–4	12	12	3–4	7–8	24	5–6

30.5cm Beta-Gerät – The First Siege Gun

The German Army's Artillerie-Prüfungskommission or APK (Artillery Test Commission) supervised development and testing of artillery. In 1893, the APK, in partnership with Krupp, found a possible solution to the fortification dilemma by designing and constructing a 30.5cm (12 inch) mortar. Such large-caliber mortars, termed *Küstenmörser* (coastal mortars), were first developed for use against iron-plated warships. However, it turned out that hitting a moving ship with mortar fire was nearly impossible, and by the 1890s the employment of mortars for coastal defense fell out of favor in most European militaries. Yet, despite the limited utility of mortars for coastal defense, the German General Staff embraced the idea of using heavy mortars to reduce land fortifications after a study showed that 30.5cm projectiles, fired at high angle, could penetrate most, if not all, permanent fortifications in Europe.

Krupp's 30.5cm mortar was of conventional design, although it was the first large-caliber piece in the German Army to have a breech and recoil mechanism. It had a short barrel (about 2.5 meters long) and an old-style gravity recoil system, as opposed to the soon-to-be-developed pneumatic recoil system. Because of its weight – 30 metric tons (30,000 kilograms) – the mortar was designed as a *Bettungsgeschütz* (foundation gun), meaning that the carriage was mounted to a base plate, which, in turn, rested upon a foundation of timber beams laid on the ground. Yet, despite its bulk, the mortar was simple to operate and had a good rate of fire – up to one shell every four minutes. Maximum range was 8,200 meters, which was approximately equivalent to the best Belgian fortress artillery at the time, but less than that of the French.

The APK accepted Krupp's mortar for service in 1897 and designated it as the *schwerer Küstenmörser* (heavy coastal mortar) L/8 or *Beta-Gerät* (Beta-Equipment) as a cover name to conceal its real purpose as a fortress siege weapon. Six pieces were fielded in the spring of 1898, followed by another three by 1906.

However, the Beta-Gerät mortar had two serious shortcomings. First and foremost was its firepower. Although the Beta-Gerät's 30.5cm armored shells were designed to penetrate the armor plate and concrete of Belgian



Fielded in 1897, the 30.5cm Beta-Gerät mortar was the German Army's first siege gun. Simple to operate and reliable, the mortar was employed throughout the war on both the Western and Eastern fronts. (M. Romanych)

and French fortifications, tests conducted in the mid-1890s revealed that its projectiles were now ineffective against recently modernized French forts. In order to avoid designing another gun, an improved projectile was developed, yet doubts still lingered about the Beta-Gerät mortar's destructive power. The second shortcoming was mobility. The mortar was very heavy, more than four times the weight of any other artillery piece in the army. Transport required disassembly into three parts – barrel, carriage, and base plate. To move by rail, each battery needed 12 railcars for the howitzers, associated equipment, and munitions, and 31 railcars when moving all battery personnel and equipment. Once offloaded at a railhead, the mortar's components, munitions, and ancillary equipment had to be carried to firing position by either narrow-gauge railway or road transport wagons pulled by steam-powered tractors. The ground was leveled by hand, wooden foundation beams were put in place, and the mortar's base plate, carriage, and barrel were mated. Although assembly was relatively simple, under ideal conditions, about 12 hours were needed to emplace

and prepare a mortar for action.

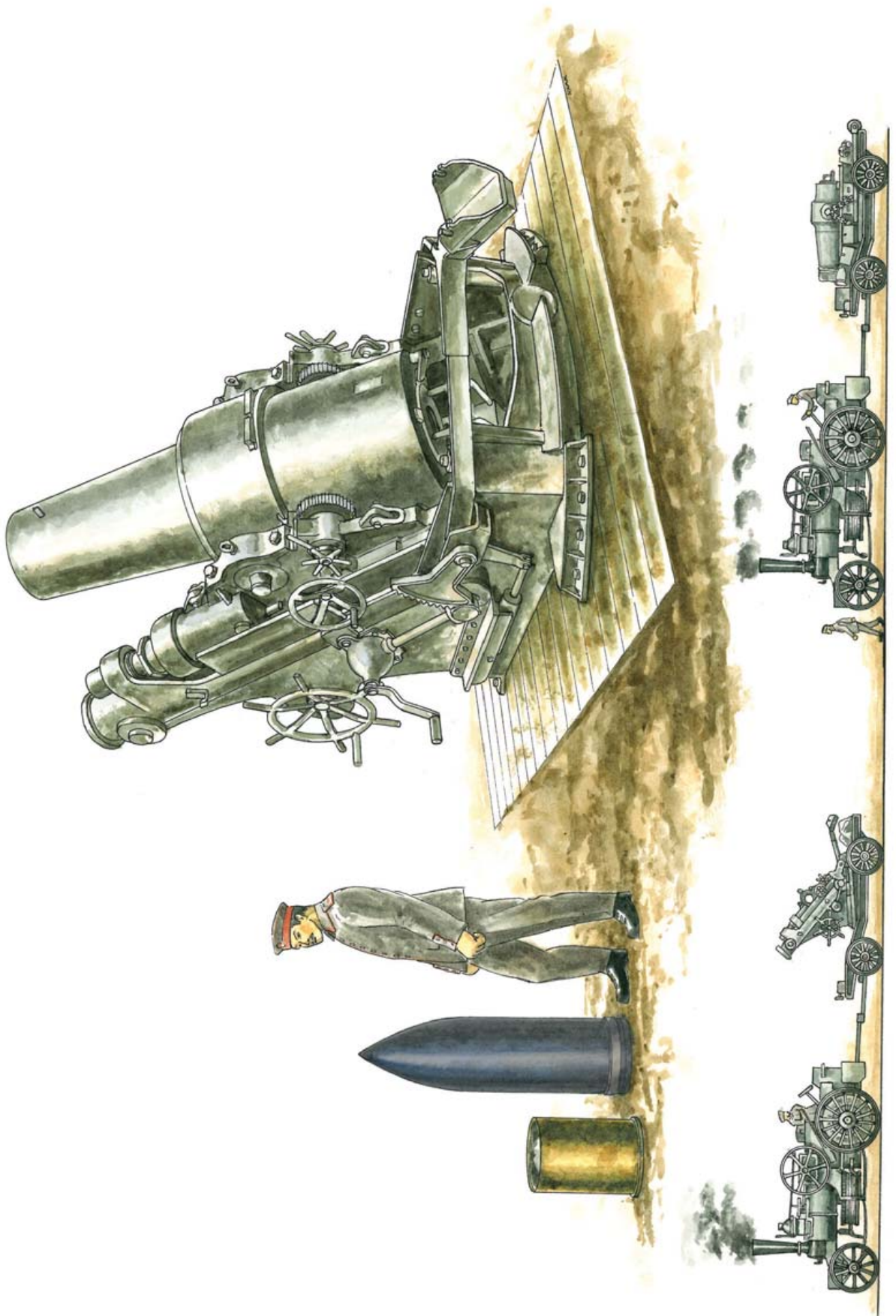
Fielding Beta-Gerät mortars did not solve the army's fortress dilemma. Yet, interest in a different siege gun remained dormant until rekindled by lessons from the Russo-Japanese War (1904–05). During the siege of Port Arthur, the Japanese Army dismantled 18 28cm (11 inch) Krupp-built coastal defense mortars from shore batteries in Japan and transported them to Manchuria where they helped end the 11-month siege. Although other European armies failed to see the value of the siege guns, both Germany and Austria-Hungary recognized the potential of large-caliber, mobile artillery as a means to quickly capture fortresses that could otherwise tie down large numbers of troops in a prolonged siege.

The need for a new siege gun was reaffirmed by Generalfeldmarschall Helmuth von Moltke (the younger) who succeeded Schlieffen as Chief

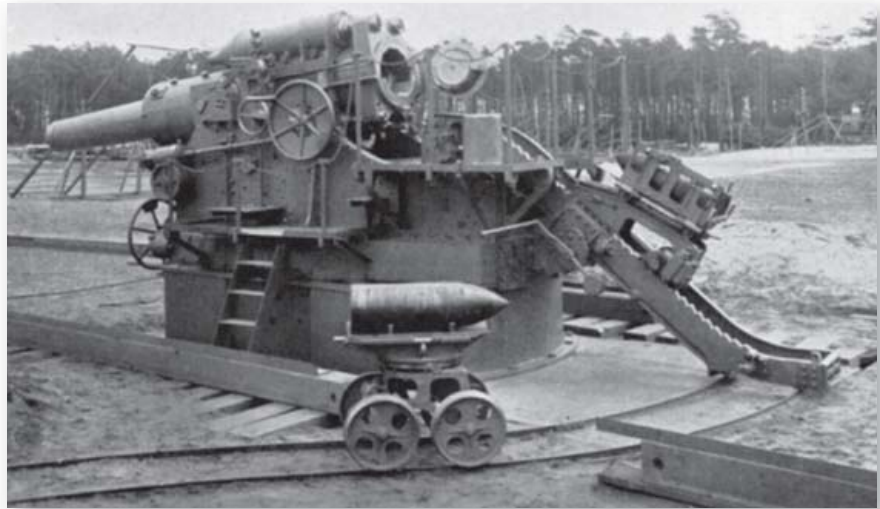
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30.5CM BETA-GERÄT MORTAR

The 30.5cm Beta-Gerät mortar was the first large-caliber siege gun fielded by the German Army for the specific purpose of destroying permanent fortifications. It was also the army's first transportable heavy mortar. Nine Beta-Gerät mortars were produced between 1898 and 1906, and because of their reliability, they served as a workhorse of the siege artillery throughout the war. The Beta-Gerät was simple to operate. Direction of fire was set by rotating the turntable in the base plate. The barrel was placed at zero degrees elevation and a projectile and a brass cartridge case containing the propellant charges were loaded in the breech. Range was primarily controlled by adjusting the number of propellant charges loaded with each projectile. However, once the mortar began firing, finer adjustments were made to azimuth and elevation using handwheels located on either side of the carriage. For firing, the barrel was placed between 50 and 60 degrees elevation. For transport, the Beta-Gerät mortar was disassembled into three components: barrel, carriage, and base plate. During the war, various means were used to move the mortar's components. Long-distance movement was accomplished by loading the mortar's components onto standard railway cars. Shorter moves, such as from a rail head to firing position or between firing positions, were accomplished by either narrow gauge (*Feldbahn*) rail, or road wagons towed by steam-powered tractors.



The 30.5cm Beta-Gerät 09 howitzer was introduced in 1909. However, production was halted after only two guns were built because of doubts about the 30.5cm projectiles' ability to penetrate the concrete and steel of the Belgian and French forts. (NARA)



of the General Staff in 1906. He directed the General Staff and APK to study the Beta-Gerät's ability to penetrate the strongest French and Belgian fortifications. The study recommended development of a more powerful artillery piece, perhaps as large as 45cm. As a result, several options were considered, after which a long-barrel 30.5cm howitzer and a large-caliber 42cm gun were slated for design and development.

In September 1907, the General Staff ordered Krupp to build an improved 30.5cm gun, and two years later the 30.5cm schwerer Küstenmörser 09, or Beta-Gerät 09 – was introduced. Now there were two versions of the Beta-Gerät – the older design Beta mortar and the new, modern Beta 09 howitzer. Like the Beta mortar, the Beta 09 was a foundation gun emplaced on a foundation of wood beams, but otherwise was a completely different design. It had a much longer barrel (a 5-meter long L/16) with a screw-type breech, a dual-cylinder pneumatic recoil system attached to the barrel, and a large carriage and box base plate to accommodate the barrel's recoil. Because the barrel stood several meters above ground level, two platforms were attached to the carriage for the crew and a hand-cranked munitions lift was mounted to the rear of the carriage to raise munitions from ground to breech level. To fire, the barrel was elevated between 43 and 67 degrees. Maximum range was 12,000 meters.

The Beta 09 was much larger than the Beta mortar, and at 45 metric tons (45,000 kilograms), about one-third heavier. Therefore, transport and assembly of the Beta 09 were even more difficult than the Beta mortar. For rail movement, each howitzer needed five railcars (two more than a Beta mortar) while an entire battery required 37 railcars. For short-distance movements, Beta 09 batteries used either road wagons pulled by steam-powered tractors or *Feldbahn* (narrow-gauge rail). To move by narrow-gauge rail, 12 railcars were needed to carry the components of one howitzer.

Because of its long barrel, the Beta 09 howitzer had greater range, accuracy, and penetrative power than the Beta mortar. Yet, the Beta 09's ballistic characteristics did not dispel concerns about the destructive power of either 30.5cm siege gun against the strongest permanent fortifications. As a result, in the spring of 1910 production of Beta 09 howitzers was halted after only two howitzers were built.

The 30.5cm siege guns were organized into five batteries, designated *schwere Küstenmörser*, or SKM batteries. Batteries 1–4 were each equipped with two Beta mortars, while Battery 5 had the two Beta 09 howitzers. One Beta mortar was not assigned to a battery. Initially, all SKM batteries were equipped with narrow-gauge railway wagons and rails. In 1912, to increase mobility, Batteries 2 and 5 were equipped with road wagons towed by steam-powered tractors.

42cm Gamma-Gerät – More Firepower

In 1906, Krupp and the APK initiated design and construction of a 42cm howitzer. The first example was delivered three years later for testing (in May 1909). Despite initial problems penetrating 30cm thick armored plate, it passed testing the next year and was accepted for service in the spring of 1911 under the pseudonym 42cm *kurze Marinekanone* (short naval cannon) 12 or *Gamma-Gerät* (Gamma-Equipment). However, at twice the size and more than three times the weight, transportation and emplacement of the Gamma were far more difficult than either model of the Beta-Gerät. Yet, despite its immobility, the Gamma was accepted by the APK because, at the time, firepower was the primary consideration for siege artillery.

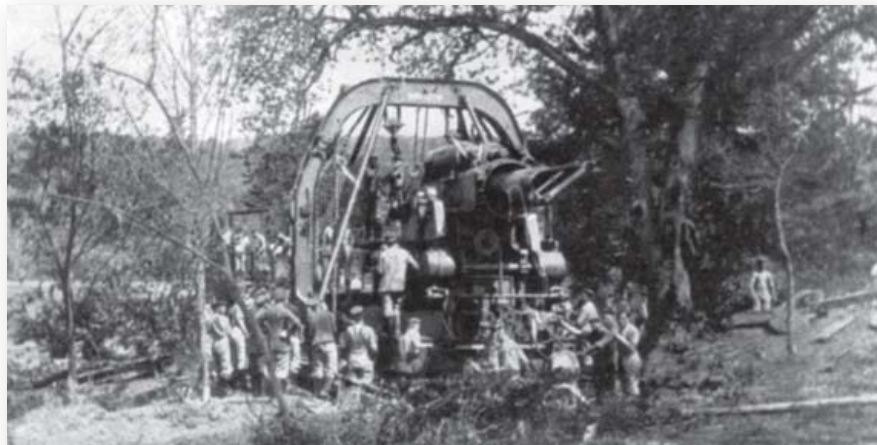
The Gamma-Gerät was basically an upscaled version of the 30.5cm Beta 09. It too was a foundation gun with a massive carriage and base plate to accommodate the recoil of its 6.7-meter long L/16 barrel. When emplaced the howitzer stood more than 4 meters above ground and weighed about 150 metric tons. Because of its bulk, the carriage required a solid foundation made of steel and timber set into a 2.25-meter deep rectangular pit. The howitzer had five major components – base plate, turntable, carriage, barrel, and munitions lift and platform – which were assembled using a special 25-ton rail-mounted gantry crane.

Gamma howitzers could only move by standard rail and were always emplaced near permanent rail lines. For transport, the howitzers were disassembled into seven loads, each weighing between 20 and 25 metric tons, loaded onto railcars, moved to the new firing site, offloaded, and then reassembled. To facilitate movement, railcars were arranged in the order



The 42cm Gamma-Gerät howitzer was accurate and had good range, but its massive size and weight meant it was better suited for positional rather than maneuver warfare. Ten Gammas were built before and during the war. (NARA)

KMK Battery 1 assembling one of its Gamma howitzers in preparation for shelling of the Dannemarie railroad viaduct in May 1915. This view, taken from the front of the howitzer, shows the barrel being slid into the cradle. (M. Romanych)



needed to emplace the howitzer: (1) wood for the foundation, (2) steel rails for the gantry crane, (3) gantry crane, (4) rear half of foundation, (5) front half of the foundation, (6) base plate, (7) carriage with turntable, (8) cradle for barrel, (9) barrel, and (10) munitions lift and platform. A battery with two howitzers needed 20 railcars for the guns and associated equipment, plus several more for battery gear, horses, vehicles, munitions, and personnel.

Preparing a firing position for a Gamma-Gerät was a major engineering feat. Construction began with building a standard-gauge rail spur from the nearest main railroad line to the firing site and laying switching tracks for

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42CM GAMMA-GERÄT HOWITZER

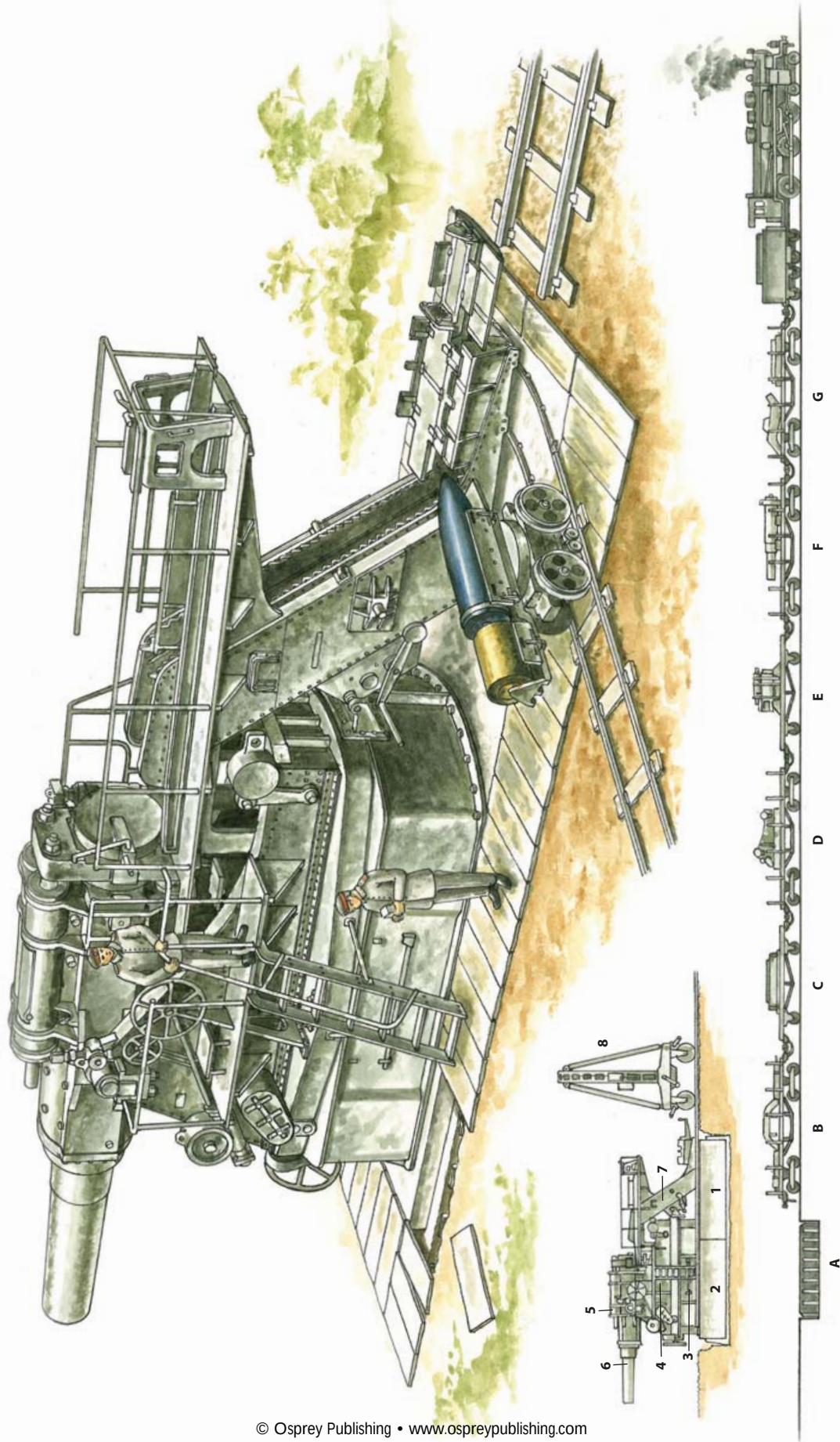
The 42cm Gamma-Gerät howitzer was the most powerful siege gun employed by the German Army in World War I. It was also the largest and least mobile siege gun, measuring 13.5 meters long and 4.25 meters high. Because of its weight – 150 metric tons – the Gamma-Gerät was emplaced on an elaborate foundation made of steel and timber set into a deep excavated pit. A 25-ton rail-mounted gantry crane was used to assemble and disassemble the howitzer. After assembly, the howitzer was set on target using an optical sight mounted on the left side of the carriage. Coarse azimuth adjustments were made using a large handwheel mounted on the front of the howitzer and then refined using a smaller handwheel mounted on the carriage. Barrel elevation for firing was between 43 and 66 degrees. A safety mechanism ensured that the howitzer could only fire when the barrel was elevated. A handwheel on the carriage moved a series of worm gears that raised and lowered the barrel. The recoil system was hydro-pneumatic with two large recuperators mounted above the barrel and two air recoil brakes and air tanks underneath. Munitions were delivered to the howitzer using a four-wheel cart mounted on a short section of narrow-gauge rail. A hand-cranked elevator on the rear of the carriage lifted the projectiles and cartridge cases (with powder charges) from ground level to the breech. The howitzer was fired by a lanyard-actuated striker that drove a firing pin into a percussion primer located in the base of the cartridge casing.

COMPONENTS OF THE GAMMA-GERÄT

1. Rear half of the foundation
2. Front half of the foundation
3. Base plate
4. Carriage with turntable
5. Cradle
6. Barrel and breach
7. Munitions elevator and platform
8. Gantry crane

GAMMA-GERÄT HOWITZER ON RAIL CARS

- A. Foundation
- B. Gantry crane
- C. Base plate
- D. Carriage with turntable
- E. Cradle
- F. Barrel and breech
- G. Munitions elevator and platform





By 1916, Gamma howitzers were fitted with armored cabs to protect the crew in the event that the gun was shelled by enemy counter-battery fire. This howitzer is emplaced near Biache-Saint-Vaast in October 1917. (M. Romanych)

maneuvering the railcars during emplacement. Meanwhile, battery personnel cleared the firing position of vegetation and dug the pit for the foundation. Once spur tracks and the foundation pit were completed, the first railcar with wood for the foundation was moved into position and offloaded. Some of the wood was used to line the walls of the pit and keep the surrounding earth from collapsing into it. With the retaining walls in place, 50cm square timber beams were placed in the bottom of the pit and bolted together into a lattice footing and timber jacks were set on each side of the pit to support the steel rails for the gantry crane. The second

railcar with rails for the gantry crane was moved in position and the rails were offloaded and placed on either side of the foundation pit and along the spur rail line so the gantry crane could straddle both the foundation and the spur line. In this way, it could roll back and forth between the railcars and foundation. When work on the rails was completed, the railcar carrying the gantry crane was moved into place and the crane was offloaded, assembled, and placed on its rails so it could move loads from the railcars. Once preliminary site work was done, assembly of the howitzer could begin. Under ideal conditions, aside from time needed to lay the rail line to the firing positions, 12 hours were needed to dig and prepare the foundation hole.

Another 12 hours were needed to put the howitzer together. Assembly began with the crew using the gantry crane to offload the rear and front halves of the foundation from the fourth and fifth railcars, and placing them into the pit on the timber beams. Lifting loads from the railcars was time consuming, taking 16 crew members working two hand cranks, one on each side of the crane, about an hour to move a single load from a railcar. The foundation halves were joined into a single unit and leveled. Next, the gantry crane unloaded the howitzer's base plate from its railcar. The base plate was placed on the foundation and bolted down. Next, the turntable and carriage were unloaded and bolted to the base plate. Then the cradle was installed on the carriage, followed by the barrel, which was slid into and attached to the cradle. Lastly, the munitions lift and platform for the crew were offloaded and attached to the howitzer.



The 28cm L/12 i.R. howitzer was essentially a large version of the heavy artillery's 21cm howitzer. Only one prototype howitzer was built and fielded in 1914 with SKM Battery 7. (M. Rupp)

Because of its long barrel and stable foundation, the Gamma was very accurate and, with a maximum range of 14,000 meters, it could outrange both Belgian and French fortress artillery. Rate of fire was one round about every seven minutes (eight rounds per hour), although the highest reported rate of fire for one howitzer was an astounding 19 rounds in one hour, and 30 rounds in an hour by a two-howitzer battery, although these rates could be maintained for only a very short time.

Although the Gamma howitzer had the destructive power required by the General Staff, it was much less mobile than either of the Beta-Gerät mortars. The emerging German war plan required siege guns to keep pace with the advance of the army and swiftly reduce permanent fortifications. Bound to the rail system, which could be easily disrupted by enemy action, and needing 24 hours or more to emplace, there was no guarantee that the Gamma batteries could get into battle in time. Yet, even though worries persisted about the Gamma howitzer's immobility, the APK ordered the first howitzer in 1910, followed by a second in 1911 and three more in 1912, making five Gamma howitzers, organized as two batteries with a howitzer in reserve, available at the beginning of the war. Another five howitzers were built during the war, for a total of ten, along with 18 extra barrels.



The 28cm howitzer L/14 i.R. in service with SKM Battery 8. This gun and the 28cm L/12 i.R. howitzer of SKM Battery 7 were valued on the Eastern Front for their mobility and high rate of fire. (M. Romanych)

42cm M-Gerät – Greater Mobility

The immobility of the Beta and Gamma howitzers remained a vexing problem. For the APK, the solution lay in mounting the next-generation siege gun on a *Räderlafette* (wheeled carriage). As early as 1907, Krupp began studying the concept of road-transportable siege guns. Technical tests satisfactorily demonstrated the feasibility of hauling siege guns mounted on wheeled carriages over roads and solid ground. The result of the tests was a series of wheeled carriage prototypes that eventually became forerunners to the mobile 42cm howitzer. The first design was a 28cm (11.2 inch) howitzer L/12 in *Räderlafette*, or i.R., which was similar in design to the Krupp 21cm howitzer. The howitzer had a range of 9,700 meters with a good rate of fire (15 rounds per hour). It was a detachable howitzer, separated into two loads – barrel and carriage with cradle – for transport. Krupp also made a longer-barreled version of the 28cm howitzer, designated the 28cm howitzer L/14 i.R., which was comparable to the L/12 howitzer except for its longer barrel and blast shield. At the same time, the firm of Erhardt built a 28cm howitzer to sell to the Russian Army. It too was a detachable howitzer, but it had a shorter range (6,000 meters). Both firms offered their howitzers to the APK, but because the APK wanted a wheeled 30.5cm howitzer, none of the 28cm guns went into production. Meanwhile, between 1910 and 1912, Krupp built a 30.5cm howitzer L/17 in *Räderlafette*, or Beta i.R. The design was based on the wheeled 28cm L/12 i.R. howitzer. Unusual for the Beta i.R. – as a siege gun – was its large blast shield meant to shelter the gun crew from the muzzle

The German Army's first large-caliber siege gun mounted on a wheeled carriage was the 30.5cm Beta i.R. howitzer. The design of the howitzer incorporated features from both the 28cm L/12 i.R. and L/14 i.R. howitzers. (M. Romanych)



A production model M-Gerät howitzer assigned to KMK Battery 10. The development and employment of the M-Gerät howitzers were closely held secrets. (M. Romanych)



blast. For transport, the Beta i.R. was disassembled into three pieces; barrel, carriage, and shield. Three to four hours were needed for assembly and emplacement. Maximum range was 12,000 meters. However, despite its good mobility and range, the howitzer did not go into production because it too lacked the firepower needed to guarantee success against the strongest French and Belgian fortifications. All three of Krupp's prototype wheeled siege howitzers saw service with the German Army during the war.

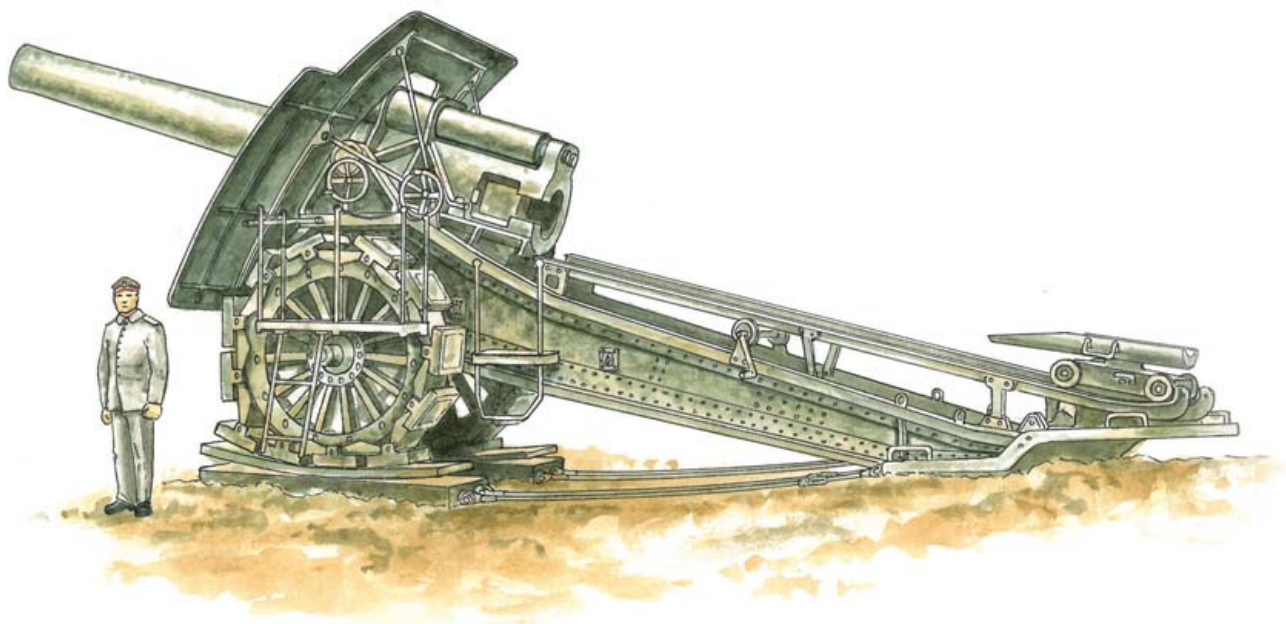
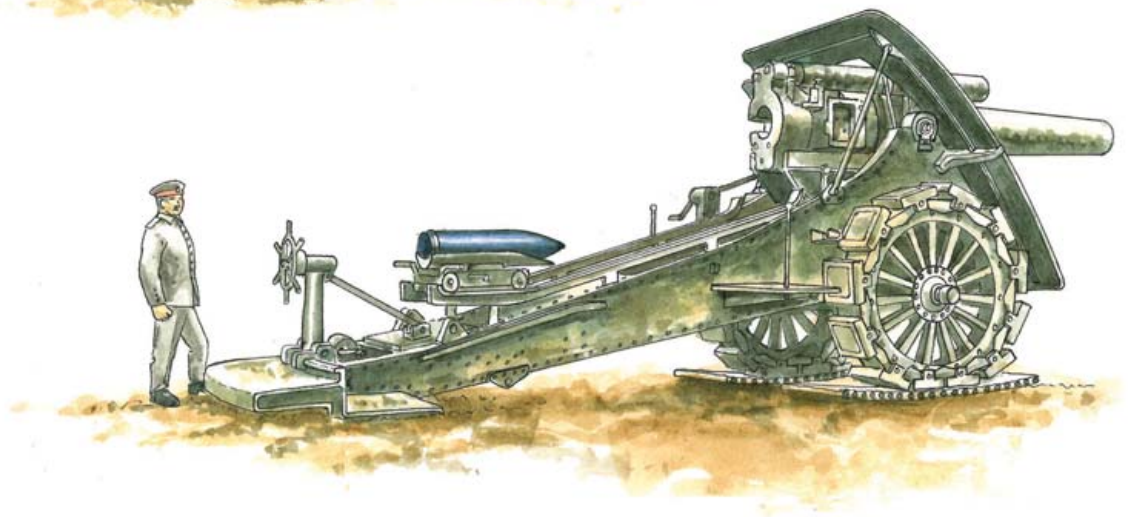
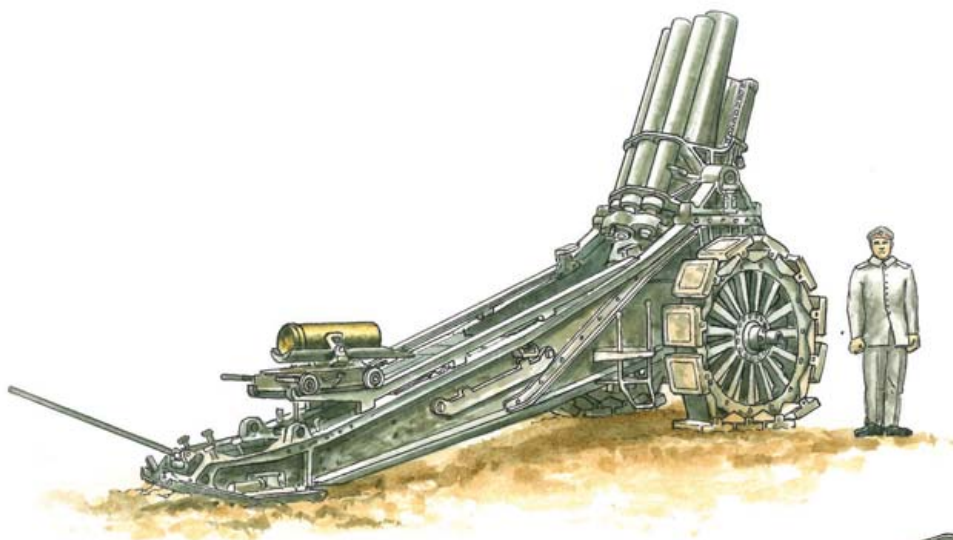
In autumn 1911, the APK and Krupp developed specifications for a wheeled 42cm howitzer and within a few months Krupp delivered a design. This howitzer was designated the 42cm *kurze Marinekanone 14 L/12 in Räderlafette* or M-Gerät (M-Equipment). The "M" stood for *Minenwerfer* (mine launcher), which literally meant a gun that fired a large explosive round at a high trajectory over a short range. The idea of naming the howitzer after a *Minenwerfer* came from demonstrations of short-range mine launchers built by Erhardt for the *Pionier* (engineer) troops. In fact, the M-Gerät was the logical successor to the 30.5cm Beta i.R. howitzer.

Except for its caliber, the M-Gerät had nothing in common with the Gamma howitzer. The M-Gerät was mounted on a large two-wheeled carriage and was much lighter. At 42 metric tons it weighed two-thirds less than the Gamma. The reduction in weight was achieved by redesigning the barrel – shortening

C

MOBILE SIEGE GUNS

Beginning in 1907, the German Army explored the possibility of mounting siege guns on wheeled carriages (*in Räderlafette*, or i.R.). Three prototypes – two 28cm and one 30.5cm –howitzers were built. The 28cm L/12 (top) and L/14 (centre) i.R. guns were forerunners to the 30.5cm Beta i.R. (bottom), which in turn was the predecessor to the wheeled 42cm M-Gerät howitzer. All the three prototype howitzers shared several common design features, although there were also distinct differences such as the 28cm L/12 howitzer's recoil mechanism with its three recoil cylinders, and the 28cm L/14 and 30.5cm Beta i.R. howitzers' blast shields. Because of their weight – between 17 and 24 metric tons – the howitzers had to be disassembled and transported in several loads pulled by motor truck or tractor. For off-road movement, the howitzers' wheels were fitted with articulated feet known as *Radgürtel* (wheel belts). When emplaced, the wheels rested on a mat of iron tubes (*Rohrmatten*), which were transported in rolls and laid out to create a firm foundation. Special equipment was used to handle the munitions. Shells were brought to the howitzers by a two-wheel handbarrow and then transferred to a wheeled tray which was pushed to the breech along rails mounted to the upper edge of the carriage. A long ramrod was used to seat the projectiles and cartridge cases. Loading the howitzers required a crew of six to eight men. None of these howitzers were put into production, but once the war began, all three were assigned to siege batteries and sent to the Front.





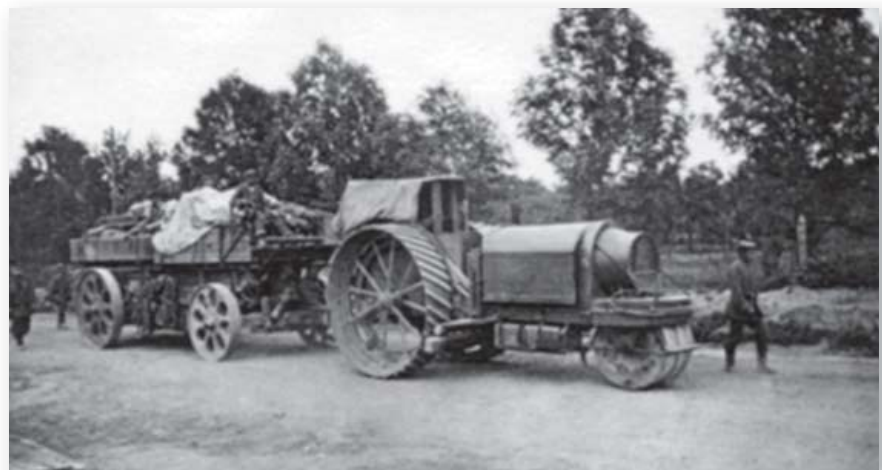
An M-Gerät howitzer being assembled in Flanders during the German counter-offensive at Cambrai in November 1917. The crew is about to attach the spade to the gun carriage. (M. Romanych)

its length by 1.7 meters, thinning the walls, and using a simpler sliding-wedge breech. The tradeoff for mobility was 30 percent less range (9,300 meters), decreased accuracy, and less penetrating power. Rate of fire was one round every seven or eight minutes.

For transport the M-Gerät howitzer was disassembled and loaded onto five wheeled road wagons that weighed between 16 and 20 metric tons. Each wagon – numbered one through five in the order needed during assembly of the howitzer – was specially designed to carry its respective load. Wagon 1, the equipment wagon, carried the gantry

crane and material needed to assemble and disassemble the howitzer barrel. Wagon 2, the platform wagon, had the foundation platform and steel girder rails for hauling the carriage into place on the platform. Wagon 3, the cradle and spade wagon, had the cradle for the howitzer's barrel and spade. Wagon 4, the carriage wagon, consisted of the howitzer's own wheeled carriage and trail coupled to a pair of front wheels. The wagon also carried the gantry platform, munitions' hoist, and blast shield. Wagon 5, the barrel wagon, carried the howitzer's barrel and breechblock.

However, even when disassembled and loaded onto the road wagons, transport of the M-Gerät remained a problem because the howitzer could not be disassembled into loads that horses or steam-powered tractors could pull over long distances or off-road. This situation was solved by using modified gasoline-powered agricultural tractors built by the firms of Podeus, Poehl, and Lanz to tow the road wagons. On good roads the tractors could move up to 7 kilometers an hour. For cross-country movement the wagons were often equipped with *Radgürteln* (literally, wheel belts), which were a series of articulated feet fastened around each wheel to reduce ground pressure and thus facilitate transport over soft ground. In addition to the tractors, each battery had four ordinary motor trucks to carry small parts, tools, and supplies.



A variety of tractors were used to move the siege guns. Here an 80-horsepower three-wheel Lanz tractor tows the 17-metric-ton platform wagon of an M-Gerät howitzer. (M. Romanych)

Emplacement of an M-Gerät was quicker, but no less a feat, than assembling a Gamma. First, the emplacement site was cleared of vegetation and leveled by hand. If the ground was soft, then crushed stone or a lattice of wood planks was laid down to provide a firm base. The equipment wagon was moved to the site by tractor. The gantry crane was offloaded, assembled, and placed over the center of the howitzer's firing position. The tractor moved forward of the position where it could haul the other wagons into place with its winch. The platform wagon was then hauled under the gantry crane and the foundation platform was unloaded. The wagon was pulled clear and the platform lowered to the ground and oriented in the general direction of fire. Next, two steel U-beams were attached to the platform to serve as ramps. The cradle and spade wagon was then pulled into position and up the ramps onto the foundation platform. The spade was unloaded using the gantry crane and set to one side of the platform. The cradle was then lifted and left suspended above the platform while the wagon was hauled away. The carriage wagon was pulled onto the platform and centered under the suspended cradle. The cradle was lowered and attached to the carriage, followed by the blast shield, which was assembled and attached to the cradle. The munitions crane was attached to the carriage as well. The front wheels of the wagon were uncoupled and pulled away. The barrel wagon was moved into place and the howitzer barrel was lifted and mated to the cradle. The spade was put in position and coupled to the trail of the carriage and the traversing and loading gears were assembled. Finally the gantry crane, ramps, and other equipment were removed and the howitzer was ready for firing. Under ideal conditions, six hours were needed to emplace a howitzer.

The APK ordered the first M-Gerät howitzer in July 1912 and a second in February 1913. The first gun was delivered to the army in December 1913 and underwent testing soon thereafter. Mobility trials were conducted with steam and benzene (gasoline) motor tractors and teams of horses. The benzene motor tractors were selected as the best means of locomotion, and the battery was equipped with Podeus 80-horsepower tractors even though they lacked sufficient power to haul the transport wagons over long distances or hilly terrain. Test firing began in February 1914 at the Meppen range with good results. The Kaiser took interest in the howitzer and had the APK move it to the Kummersdorf range where he saw a live demonstration. The APK identified various improvements for completion by October 1914 when the first battery was scheduled to be formed. The howitzer returned to the Krupp factory at Essen and was soon joined by the second howitzer in June. Thus, both M-Gerät howitzers were still undergoing modifications when the war broke out and work continued right up until the howitzers were rushed to the Front during mobilization. During the war, it was the M-Gerät that was dubbed the "Big Bertha."

With two M-Gerät howitzers on hand, the APK ordered another two on July 31, 1914, followed by two more on August 28, and another two on November 11. These guns were delivered in mid-1915 and early 1916.

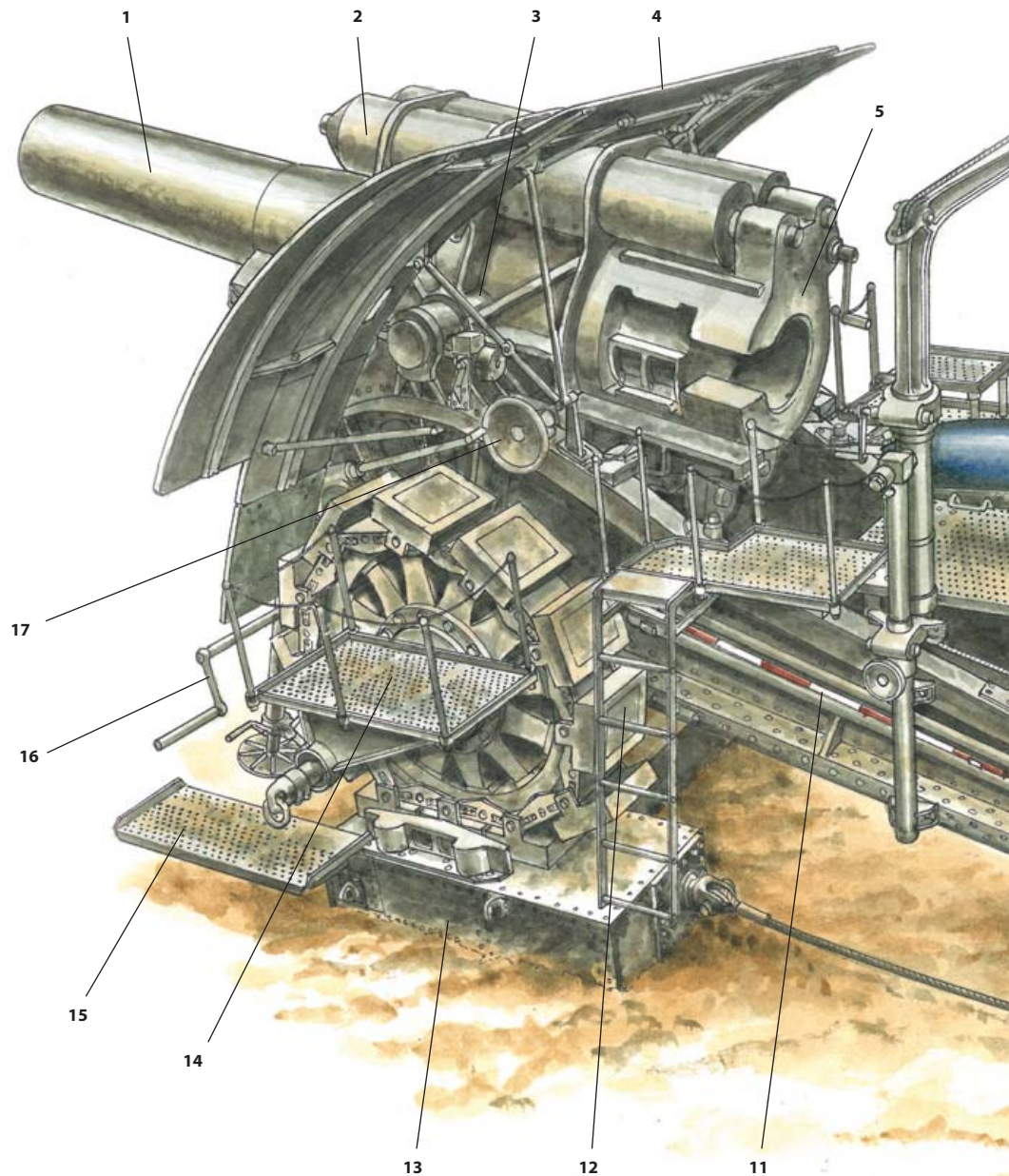


View of an 80-horsepower Podeus tractor towing an M-Gerät barrel wagon. Weighing 20 metric tons, the barrel wagon was the heaviest load in an M-Gerät howitzer battery. (M. Romanych)

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"BIG BERTHA," THE FORT KILLER

The 42cm M-Gerät howitzer was the German Army's ultimate siege gun, combining mobility and firepower into an effective fort killer. In the summer of 1914, the German Army had only two of the howitzers, both of which were undergoing post-testing modifications at the Krupp factory and were not engineered into final production form. Illustrated here is one of the two prototype howitzers. When war broke out, both M-Gerät howitzers were rushed from the factory to Liège where they easily destroyed two forts and brought the siege to an end. They repeated the feat again at the fortress of Namur. Impressed by their destructive power, German soldiers nicknamed the M-Gerät howitzer "Big Bertha."

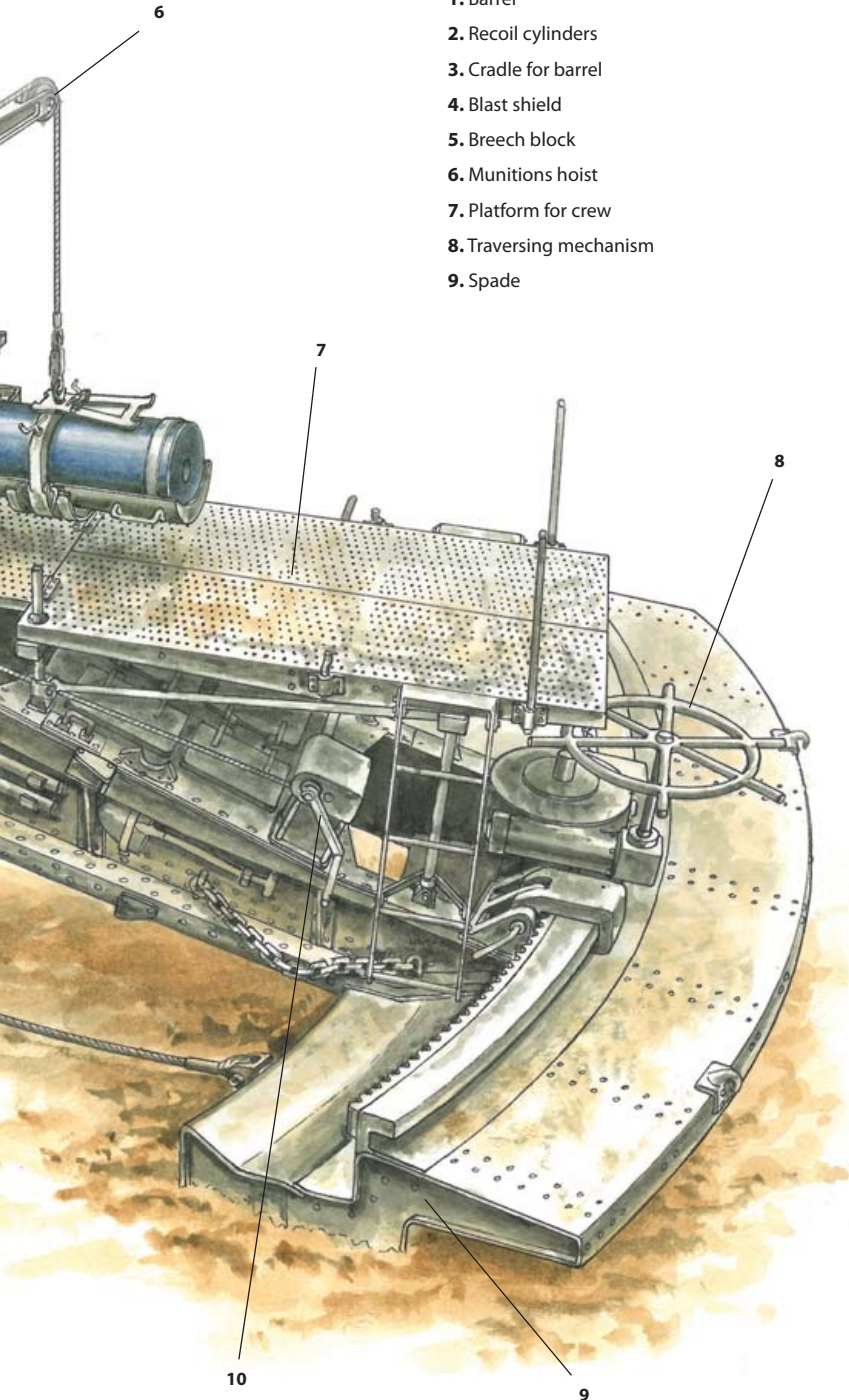


Specifications

Caliber	42cm (16.5 inches)
Dimensions	10 meters long, 4.7 meters wide, 4.5 meters high
Weight	42,600 kilograms
Barrel Length	L/12 (5.04 meters)
Maximum Barrel Elevation	65°
Maximum Range	9,300 meters
Rate of Fire	8 rounds per hour

KEY

1. Barrel
2. Recoil cylinders
3. Cradle for barrel
4. Blast shield
5. Breech block
6. Munitions hoist
7. Platform for crew
8. Traversing mechanism
9. Spade
10. Hand winch for munitions hoist
11. Aiming stake
12. Wheel belt
13. Foundation platform
14. Platform for gunner
15. Forward crew platform
16. Elevating hand crank for coarse range adjustments
17. Elevating handwheel for fine range adjustments





An M-Gerät howitzer on road march. When traveling, the road wagons were covered with canvas tarps to keep dirt off the howitzers' components and to hide their technical details from view.
(M. Romanych)

By the war's end, Krupp had built and delivered 12 M-Gerät howitzers.

On the eve of World War I, Germany and Austria were the only nations to have large-caliber siege artillery. Germany's development of mobile siege guns was a closely kept secret. Although Krupp had built and publicly displayed a 42cm static coastal defense howitzer (the 42cm *Küstenkanone Modell 1886*) at the Chicago World's Fair in 1893, the French and Belgian armies were unaware of the existence of Germany's transportable 42cm

siege guns. Some information and rumors leaked out about the existence of the 30.5cm howitzers, but the matter was not taken seriously. As a result, the appearance of the 42cm howitzers, especially the wheeled M-Gerät, constituted a major surprise in the opening weeks of the war.

Munitions

Three types of projectiles were produced for the siege artillery – a *Panzergranate* (armored projectile), a *Langgranate* (long projectile), and a *kurze Haubengranate* (short projectile with ballistic cap). The armored projectile was designed to penetrate concrete and iron or steel armor. It was a solid shot round with a hardened tip. Later, a small explosive charge was added to facilitate spotting by the forward observers. The destructive power of the armored projectile was due to its mass and plunging trajectory; however, the rounds were not widely used because they were largely ineffective against targets made of reinforced concrete.

The long projectiles were high-explosive rounds with thinner walls and a large explosive charge. They were lighter and could be fired further than the armored rounds. Later, the rounds were made with two separate explosive charges for safer handling. The long projectiles were fitted with a fuse with three settings: no delay, short delay, or long delay. Fuses set to “no delay” detonated the round at the moment of impact, resulting in a large burst radius. Craters made by 42cm high explosive rounds were as large as 6 meters deep and 9 meters wide. Rounds with fuses set to “delay” penetrated the target before detonating. The 42cm projectiles could penetrate up to 12 meters of earth and concrete before exploding.

The short projectiles had a small explosive charge and thus weighed about half as much as the long projectiles and could be fired further, extending the range of the siege gun. Additionally, short projectiles were fitted with a ballistic cap to reduce air resistance and increase hit probability.

Projectiles for 30.5cm guns were about 1 meter long and weighed between 220 or 410 kilograms, depending on the type, while 42cm rounds were about 1.5 meters long and depending on type, weighed between 400 and 1,160 kilograms. The munitions consisted of separate projectiles and brass cartridge cases. The cartridge cases held the powder propellant, a percussion-type

primer, and were used to seal the barrel's breech. In the case of the Gamma-Gerät, the cartridge case could hold up to 75 kilograms of powder. Cartridge cases were reused 40 times or more, so a siege battery only kept a few on hand. To protect cartridge cases from dents and other damage, they were stored and transported in wicker baskets.

Siege artillery munitions were manufactured in small lots, which resulted in variations that affected ballistic performance and accuracy of the guns. More importantly as the war progressed, several siege guns were destroyed by rounds detonating prematurely in the barrels. Barrel bursts, first occurring in early 1916, demolished the siege guns and sometimes injured or killed crew members. After considerable study, the cause was attributed to faulty munitions. In response, the guns were fitted with long lanyards and the crews were required to dismount the gun and move to a safe distance each time a round was fired.

OPERATIONAL HISTORY

Battery Organization

Before the war, siege guns were assigned to “non-standing batteries,” meaning that the guns and equipment were maintained for service and battery personnel were identified, but the batteries themselves were formed only upon mobilization. No pre-war siege artillery batteries trained or operated as units before the war. Once mobilized, batteries were assigned to armies by the Oberste Heeresleitung (Supreme Army Command) as independent artillery units. In turn, armies allocated the batteries to corps for specific operations.

The German Army had two basic types of siege artillery batteries – *kurze Marinekanonen* or KMK (short naval cannon) equipped with 42cm howitzers, and *schwere Küstenmörser* or SKM (heavy coastal mortar) batteries equipped with 28 or 30.5cm guns. Most KMK and SKM batteries had two howitzers, although a few batteries were formed as half-batteries with a single howitzer. During the war, several batteries operated with only one howitzer when one of the two assigned guns became non-operational.

The established strength of an SKM battery was 135 personnel (six officers, 129 noncommissioned officers and soldiers). KMK batteries were larger with 240 personnel (six officers and 234 noncommissioned officers and soldiers). Rarely did batteries have their exact established strength and they were often augmented by infantry for security and engineers for emplacement.

Operation of the Siege Guns

Typically, siege artillery batteries were emplaced behind hills or in forests in order to conceal their position from enemy observation. Ideal battery positions had easy access, level ground for emplacement of the guns, and concealment for the battery trains. When possible, firing sites were selected and prepared before arrival of the guns. Selection of firing positions for the

An M-Gerät howitzer in firing position. Seen here, the crew has attached a handling bar to the tip of a projectile so that they can lean the round on its side and then roll it over the wooden planks to the howitzer. (M. Romanych)



Staged photograph of crewmen loading the 30.5cm Beta i.R. howitzer of SKM Battery 6. Visible are the projectile, the cartridge case, the ramrod, and the munitions cart. (M. Romanych)



30.5cm Beta-Gerät 09 and 42cm Gamma batteries was sometimes difficult since the guns could not move far from a standard-gauge rail line. Because the accuracy of the siege guns decreased with range, the batteries always emplaced as close as possible to their target.

The siege guns were set up facing the direction of their target and far enough apart so that they would not interfere with each other's operation. For the 30.5cm Beta mortars, the typical distance between guns was about 80 meters. Later in the war, the siege guns were emplaced much further apart – up to a kilometer – to mitigate Allied counter-battery fire.

Fire was indirect, meaning that there was no direct line of sight between the gun and its target. To conserve rounds, siege guns fired only when the target could be seen by observers and rarely fired at night or in bad weather when the target could not be seen. When a battery was ready to fire, forward observers, usually an officer, established an observation post near the front line to identify and observe the target. Communication between the observers and the howitzers

was by field telephone. Only one of a battery's guns was used to range the target. The first impact was observed and subsequent rounds were then "walked onto the target" by adjusting the gun's azimuth and elevation. Time of flight for the rounds was approximately a minute. The projectiles flew slowly enough – about 250–400 meters per second – that they could be seen with the naked eye. When the ranging howitzer found the target, the firing data was shared with the battery's other gun, and both guns commenced firing.

Allocation and expenditure of rounds was closely managed by higher headquarters. The batteries maintained only a small stock of shells. Once in firing position, the projectiles were stored in dugouts near the firing positions. Heavy wooden planks were laid down between the dugouts and the howitzer and the shells were rolled by hand to the gun and then cleaned before loading. Resupply was a difficult task conducted by battery personnel who shuttled back and forth with trucks and wagons between the battery position and the munitions supply point.

Early in the war, crews manned the M-Gerät howitzers when firing; however, after rounds began prematurely detonating in the barrels of the howitzers at Verdun in 1916, crewmen were required to dismount the gun before firing. (M. Romanych)



Other than the use of heavy ammunition handling equipment, firing procedures for siege artillery were similar to other heavy artillery guns. After every 50 shots, a siege gun was examined by battery personnel. If necessary, repairs were made on the spot using tools and replacement parts in the battery. When a battery left the Front for a rest period, its guns were overhauled in an artillery workshop.

Lacking mobility, siege batteries were vulnerable to counter-battery fire if detected and located. Particularly troubling was the large plume of smoke that the siege guns discharged when firing. Depending on weather and light conditions, the plume could be seen some 20 kilometers away. To deceive the enemy, the siege batteries built decoy battery positions and used special smoke generators to simulate the smoke plume at a location away from the battery. These measures were sufficient until later in the war when the French and British began using aerial photography and then technological sound and light detection means to locate artillery positions. In response, the siege batteries set up in wooded areas, camouflaged their positions against spotter aircraft, and spaced the battery guns further apart to survive an artillery attack. For a while, smoke screens were used to hide battery positions, but proved ineffective and even dangerous because they invited the attention of Allied artillery.



German siege guns discharged a large plume of smoke topped by a ring when firing, providing an opportunity for Allied observers to spot the gun's location. This photograph was taken at a distance of about 4 kilometers from the gun's location. (M. Romanych)

Formation of the Siege Artillery Batteries		
Battery	Date of Formation	Assigned Guns
SKM 1	Mobilization	2 x 30.5cm Beta-Gerät
SKM 2	Mobilization	2 x 30.5cm Beta-Gerät
SKM 3	Mobilization	2 x 30.5cm Beta-Gerät
SKM 4	Mobilization	2 x 30.5cm Beta-Gerät
SKM 5	Mobilization	2 x 30.5cm Beta-Gerät 09
SKM 6	Mobilization	1 x 30.5cm Beta i.R.
SKM 7	Mobilization	1 x 28cm L/12 i.R.
SKM 8	January 1915	1 x 28cm L/14 i.R.
SKM 9	June 1916	2 x 30.5cm Beta-Gerät
SKM 10	June 1916	2 x 30.5cm Beta-Gerät
KMK 1	Mobilization	2 x 42cm Gamma-Gerät
KMK 2	Mobilization	2 x 42cm Gamma-Gerät
KMK 3	Mobilization	2 x 42cm M-Gerät
KMK 4	October 1914	1 x 42cm Gamma-Gerät
KMK 5	June 1915	2 x 42cm M-Gerät
KMK 6	Summer 1915	2 x 42cm M-Gerät
KMK 7	Early 1916	2 x 42cm M-Gerät
KMK 8	May 1916	2 x 42cm Gamma-Gerät (1918: 2 x 30.5cm Beta-M-Gerät)
KMK 9	Summer 1916	1 x 42cm Gamma-Gerät
KMK 10	Summer 1916	1 x 42cm M-Gerät (1918: 2 x 30.5cm Beta-M-Gerät)
KMK 11	Summer 1916	1 x 42cm Gamma-Gerät

KMK Battery 3's two M-Gerät howitzers emplacing in either Belgium or France in 1914. The howitzer to the left has not received its barrel yet. (M. Romanych)



1914 – Belgium and France

At the outbreak of the war, the German Army mobilized ten siege artillery batteries with 18 guns. SKM Batteries 1–4 were each equipped with two 30.5cm Beta mortars, SKM Battery 5 had two 30.5cm Beta 09 howitzers, SKM Battery 6 had the 30.5cm Beta i.R. howitzer and SKM Battery 7 had the 28cm L/12 i.R. howitzer. KMK Batteries 1 and 2 had two 42cm Gamma howitzers each and KMK Battery 3 had the two 42cm M-Gerät howitzers. In October, an 11th battery, KMK Battery 4, was formed with a single 42cm Gamma-Gerät.

All siege artillery batteries were assigned to the Western Front. Because the number of batteries was four short of the pre-war planning estimates, the German General Staff requested four batteries (eight howitzers) of Skoda 30.5cm Model 11 howitzers from the Austro-Hungarian Army. These batteries arrived in mid-August, participating in the sieges of Namur, Maubeuge, and Antwerp, and in attacks against the French fortifications at Givet and the fortification zone between Verdun and Toul.

The first siege gun battery into battle was KMK Battery 3 commanded by Hauptmann Erdmann. The unit mobilized at the Krupp factory in Essen on August 5 and departed for Liège on August 10. By the time KMK Battery 3 arrived, the battle had stalemated because the German First and Second Armies had failed to seize the fortress by surprise. After a week of battle German troops managed to capture the city, but none of the forts. Additional heavy artillery (i.e., 10, 13, 15, and 21cm guns) was brought in, but several days of bombardment forced only two of the fortress' 12 forts to surrender.

On August 12, KMK Battery 3 emplaced its two M-Gerät howitzers opposite Fort Pontisse. At 1840hrs, one howitzer opened fire on the fort, joining the ongoing bombardment by 15 and 21cm howitzers. The first round fell short. Hauptmann Erdmann adjusted the howitzer's range from an observation post near the fort. Pontisse's garrison heard the rounds coming and felt the blasts getting closer as the M-Gerät found its range. The eighth shot hit the fort, penetrated the redoubt, and detonated inside, prompting the garrison to raise a white flag. However, surrender negotiations failed. Now nighttime, the battery ceased firing. The next morning, both M-Gerät

howitzers opened fire. The rounds steadily smashed the fort, heavily damaging the interior and filling the fort with noxious fumes. After four hours of pounding, the garrison surrendered. The M-Gerät howitzers had fired a total of 51 rounds against Fort Pontisse, 36 of which were direct hits.

Next, KMK Battery 3 moved inside the fortress ring to shell Fort Liers. However, the fort was heavily damaged by 21cm howitzers and surrendered before the M-Gerät howitzers were operational. With no target, the battery moved to a new position southeast of Liège where it could shell Fort Loncin. Meanwhile, two Beta mortars of SKM Battery 1 finally arrived at Liège by rail and emplaced south of the city to bombard Fort Chaudfontaine. However, the fort suffered a lucky hit by a 21cm howitzer round and surrendered unexpectedly, so the battery packed up and moved to a new position in a park inside the city where it could range the westernmost forts.

KMK Battery 3's M-Gerät howitzers opened fire on Fort Loncin on the afternoon of August 15. The shelling lasted just two hours. The 25th round hit an ammunition magazine, igniting a huge explosion that completely destroyed the fort and buried most of its garrison. The catastrophic destruction of Loncin led to the end of the siege by inducing the garrisons of the two remaining forts – Hollogne and Flémalle – to surrender next day, just as the Beta mortars of SKM Battery 1 began firing ranging shots in their direction.

The two M-Gerät howitzers did exactly what they were designed to do. During the 12-day siege, eight of Liège's forts were reduced by four battalions (64 guns) of 21cm howitzers. However, they had to expend vast amounts of ammunition – up to 2,500 rounds per fort – and took far more time than given by the invasion plan. In comparison, within five days, the M-Gerät howitzers quickly destroyed two forts with 76 rounds and arguably ended the siege by compelling the last two forts to surrender. The less-mobile Beta mortars had no effect because they were too slow to get into action.

The next siege was at Namur. The city was ringed by nine forts manned by fortress troops and reinforced by an infantry division from the Belgian field army. Two corps from the German Second Army were assigned to capture the fortress. Unlike Liège, the siege artillery participated in the attack from



German propaganda postcard of the ruins of Fort Loncin, which was completely destroyed after just two hours of shelling by KMK Battery 3. Destruction of the fort led to the M-Gerät howitzers being nicknamed "Big Bertha." (M. Romanych)

A Gamma-Gerät howitzer from KMK Battery 1 emplaced near Avricourt, 12 kilometers northeast of Fort Manonviller. The battery fired 158 rounds at the fort during August 25–27, 1914. (NARA)



the onset. Ten siege guns were present: two 42cm M-Gerät howitzers from KMK Battery 3 and eight (four batteries) of mobile Austrian Skoda 30.5cm M.11 mortars, which had just arrived at the Front. Second Army's two other siege artillery batteries – SKM Battery 1 and KMK Battery 2 – were delayed en route by damaged rail lines and did not participate in the siege.

The battle began on August 20 when German troops pushed Belgian infantry back to the line of forts and established artillery observation points. The next day, heavy artillery opened fire on Forts Marchovelette and Andoy. Siege artillery joined in on the 22nd with two M-Gerät howitzers assigned to Fort Marchovelette, four Skoda mortars to Fort Cognelée, and four to Fort Maizeret. Although the bombardment inflicted severe damage on the forts, all three held until midday on the 23rd when Fort Cognelée surrendered after

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42CM M-GERÄT HOWITZER

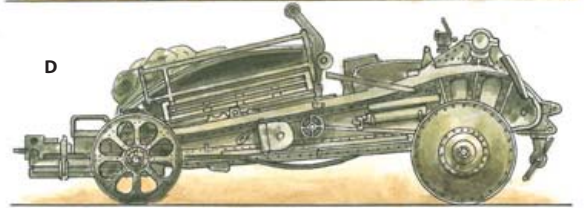
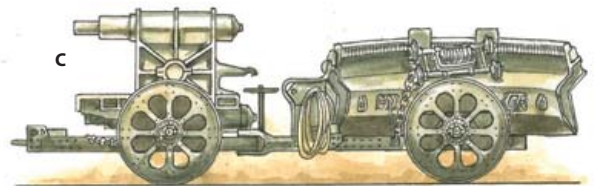
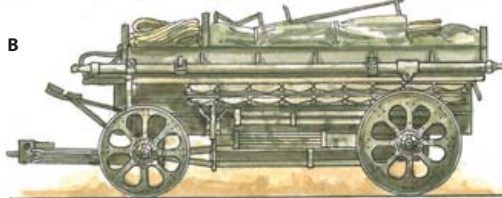
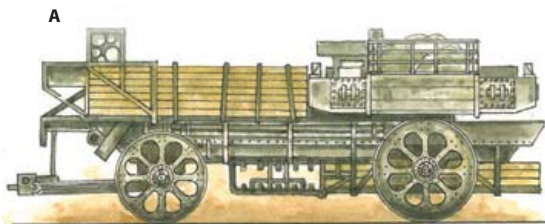
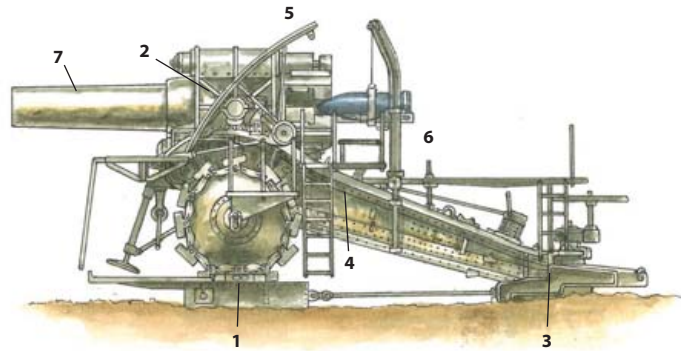
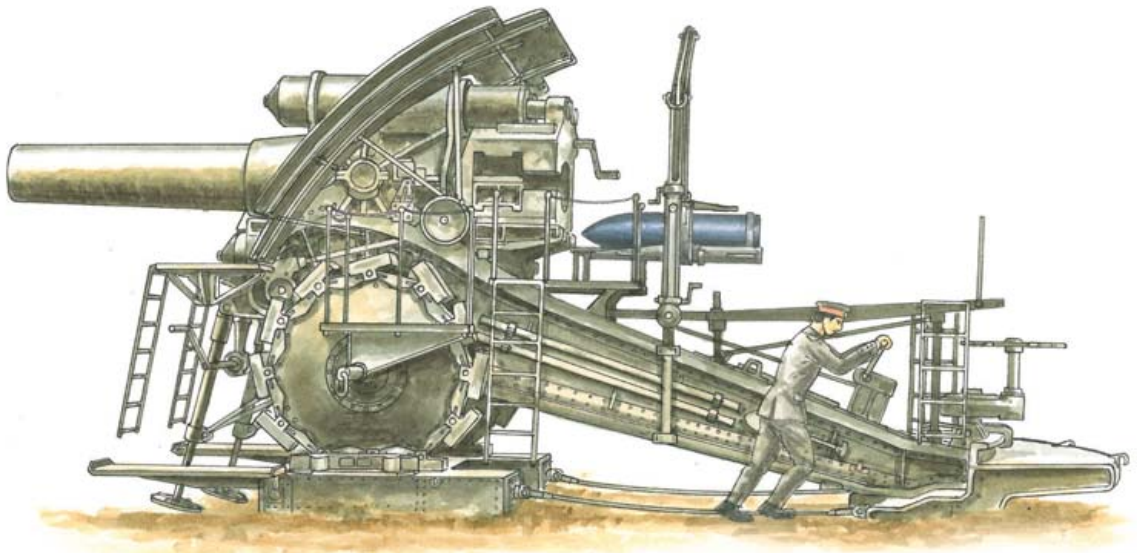
Production versions of the M-Gerät howitzer had several modifications from the two original prototype guns, including solid steel wheels, a breech that could be detached from the barrel, and a crew platform forward of the blast shield. In total, 12 M-Gerät howitzers were built by Krupp. Despite its large size (four meters tall and 10 meters long) and weight (42.6 metric tons), the basic operation of the M-Gerät howitzer was the same as any other heavy artillery piece. When emplaced, the howitzer's wheels were set upon a steel box platform, which, along with the carriage's massive spade, provided a stable foundation for firing. The spade also served as the howitzer's traverse mechanism for adjusting the direction of fire. For transport, an M-Gerät howitzer had to be disassembled and loaded onto five wheeled wagons towed by gasoline-powered tractors. Early in the war, German siege guns and ancillary equipment were painted *feldgrau*, which was a variable color ranging in hue and tone from green to gray. Later, starting in 1915, as the siege artillery units found it necessary to hide from aerial observation, various multi-colored or *Buntfarben* camouflage schemes were adopted.

COMPONENTS OF THE M-GERÄT

1. Foundation platform
2. Cradle
3. Spade
4. Carriage with wheels
5. Blast shield
6. Crew platform and munitions hoist
7. Barrel and breech block

M-GERÄT ON ROAD WAGONS

- A. Equipment wagon
- B. Platform wagon
- C. Cradle and spade wagon
- D. Carriage wagon
- E. Barrel wagon



German postcard of railcars loaded with the components of a Gamma howitzer on its way to the siege of Antwerp in September 1914. Because of weight and size, Gamma howitzers had to move by standard-gauge rail. (M. Romanych)



being hit by 59 30.5cm rounds. Two hours later, Fort Marchevelette was catastrophically destroyed when the 50th round fired by KMK Battery 3 hit an ammunition magazine and ignited an explosion that tore through the fort's interior, killing or wounding two-thirds of the soldiers. The 42cm howitzers then shifted fire to Fort Maizeret which, under the combined shelling of 21, 30.5 and 42cm guns, which fired 1,505, 64, and 50 rounds respectively, lost three of its four artillery turrets and was abandoned by its garrison. The capture of these three forts broke the fortress ring and German infantry occupied the city.

The remaining six forts quickly fell on the 24th and 25th. One of the forts – Andoy – surrendered after Skoda mortars pounded it with 450 rounds and smashed all but one artillery turret. However, the Skoda batteries expended

A 30.5cm Beta-Gerät mortar being loaded by its crew. German post-battle studies of Belgian fortifications found that 30.5cm projectiles were not particularly effective against the concrete of the forts at Antwerp, although direct hits from Beta mortar projectiles did destroy two armored cupolas. (M. Romanych)



most of their ammunition and had to cease fire. For its part, KMK Battery 3 heavily damaged Fort Suarlée and forced its garrison to surrender after hitting it with 26 rounds.

Namur was captured after five days of bombardment. Rapid fall of the fortress was the result of the siege artillery. Three forts were reduced by 21cm howitzers which fired a total of 6,763 rounds and five fell to the siege guns which fired 699 rounds. One fort surrendered without being bombarded. Of the forts bombarded by siege guns, the two M-Gerät howitzers fired 126 rounds on three forts while the eight Skoda 30.5cm howitzers shelled three with 573 rounds (one of the forts was bombarded by both 30.5cm and 42cm rounds). The 42cm howitzers were far more effective than the Skoda mortars; however, to protect the secrecy of KMK Battery 3's M-Geräts, the Skoda mortars were given credit for destroying the fortress.

Meanwhile, at the other end of the Front, the German Sixth Army in Lorraine attempted to breach the French fortress zone between Toul and Epinal. Fort Manonviller, a modern, strongly armed fort, was in the Sixth Army's path. From August 25 to 27, six batteries of 21cm howitzers, two 30.5cm Beta mortars of SKM Battery 2, and two Gamma howitzers of KMK Battery 1 pounded the fort. The bombardment lasted only 52 hours, yet the siege artillery's performance was not a resounding success because the batteries were slow getting into action and one of KMK Battery 1's Gamma howitzers had to stop firing because of mechanical trouble. In total, 4,596 21cm, 134 30.5cm, and 158 42cm rounds were fired on the fort. Yet the fort, which lost only three soldiers, surrendered because its interior was uninhabitable from noxious gases and the men of the garrison were psychologically worn out.

Following the capture of Fort Manonviller, SKM Battery 2 joined newly formed SKM Battery 7 (one 28cm L/12 i.R.) and two Skoda 30.5cm mortar batteries along the Meuse River near St Mihiel. The Skoda batteries, which were previously at Namur and the border fortress of Givet, were now supporting the Sixth Army's attempt to break through the line of barrier forts south of Verdun. From September 9 to October 16, heavy and siege artillery periodically bombarded Forts Génicourt, Troyon, Camp des Romains, Les Paroches, and Liouville. The bombardment was not enough to destroy the forts. Only Camp des Romains was captured and the Sixth Army failed to pierce the fortress zone and isolate Verdun.

After the fall of Namur, the French and British Armies retreated south towards Paris. To block the German Army's advance, ten French infantry regiments with 52 batteries of artillery were left to hold the fortress at Maubeuge. The fortifications were a ring of six partially modernized forts and seven smaller fortified interval works. Most were made of masonry and not strong enough to stand up to 21cm or larger artillery.



SKM Battery 6 with its 30.5 Beta i.R. howitzer was one of several siege artillery batteries sent to Flanders in late 1914 to shell the cities and trenches in Flanders. (M. Romanych)

KMK Battery 1 in position near Osowiec in February 1915. Both of the battery's Gamma howitzers are camouflaged to protect against Russian counter-battery fire. The crews are loading the guns. (M. Romanych)



One of KMK Battery 6's M-Gerät howitzers being assembled at Przemyśl in May or June 1915. The howitzer is receiving its barrel from the road wagon. (M. Romanych)

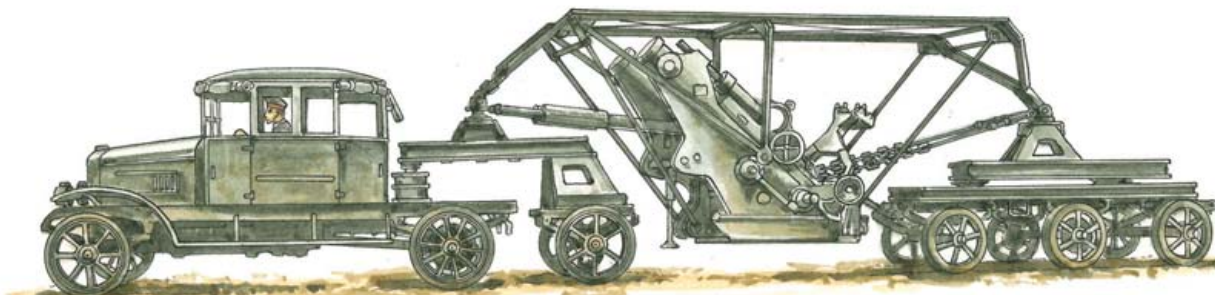
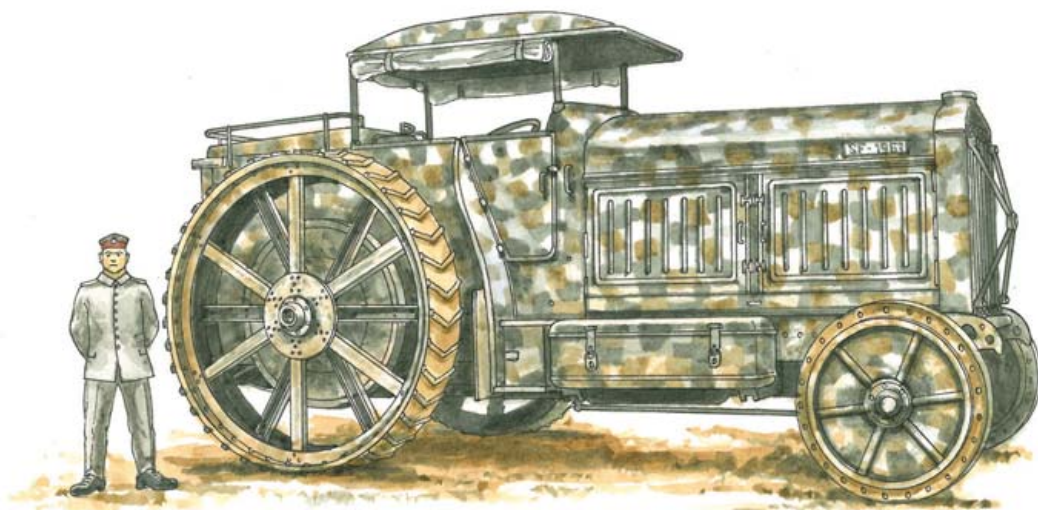
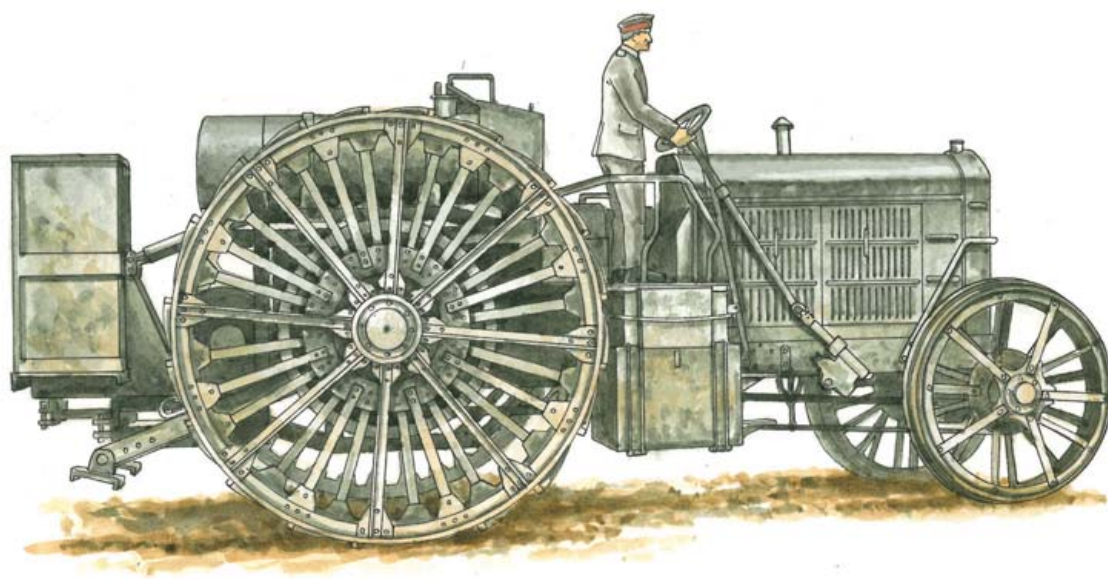


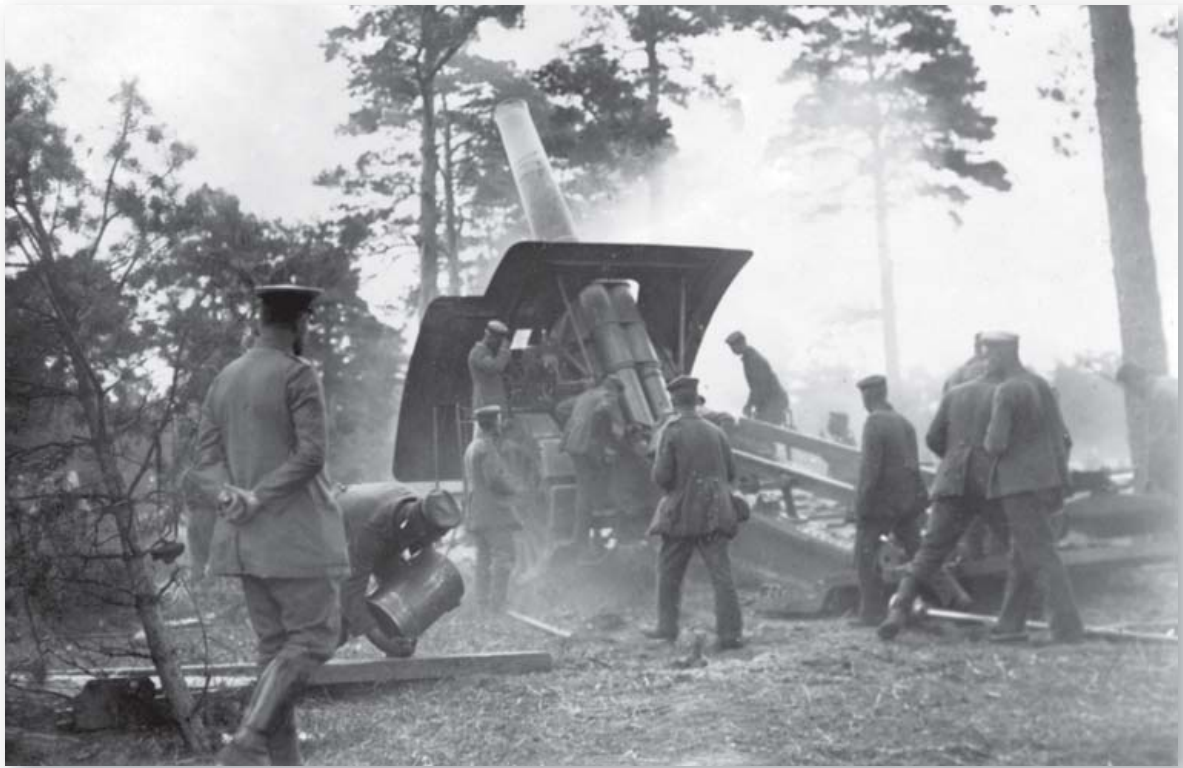
Lead elements of the German VII Reserve Corps arrived at Maubeuge on August 25 and slowly enveloped the fortress as more infantry and artillery arrived. Bombardment opened five days later by several batteries of heavy artillery intermittently firing on the northernmost fortifications. The shelling increased over the next few days as more artillery and the siege guns joined in, although shortages of ammunition kept the heavy and siege artillery from achieving rates of fire similar to that at Liège and Namur. At its peak, eight 21cm howitzer and five siege artillery batteries were firing. KMK Battery 3 (two 42cm M-Gerät), SKM Battery 5 (two 30.5cm Beta 09), and SKM Battery 6 (one 30.5cm Beta i.R.) shelled Fort Sarts and nearby fortified works Bersillies and La Salmagne, while two 30.5cm Skoda batteries fired on Fort Boussois and neighboring interval work Rocq. Despite the lack of intensity, the 30.5cm and 42cm guns soon pulverized the masonry fortifications, significantly damaging Bersillies, La Salmagne, and Boussois. Only Fort Sarts escaped damage because KMK Battery 3 mistakenly fired on field fortifications forward of the fort.

F

SIEGE ARTILLERY TRACTORS

During World War I, the German Army employed steam and gasoline-powered tractors to tow artillery. The first tractors were modified agricultural steam-powered ploughs. They were reliable and easy to operate, but were ill suited for long distance movement because they consumed large quantities of coal and water. They also lacked the horsepower to pull the heaviest siege guns over rough terrain. Therefore, at the start of the war, the army acquired a variety of gasoline-powered tractors built by the firms of Lanz, Daimler, Podelus, Sendling, Arator, and Ilseburg. Of these, the 80 PS (*Pferdestärke* or horsepower) Podelus (top) was the tractor best suited for moving the siege guns. Starting in late 1916, the army introduced new, more powerful artillery tractors built by Lanz, Bussing, and Dürkopp. The 100 PS and 120 PS (centre) Lanz tractors were first given to the 42cm M-Gerät batteries and then later, by mid-1918, all mobile siege batteries were equipped with a few of the tractors. During the last two years of the war, a *Lastenverteilergerät* (load distribution apparatus) (bottom) was developed for moving heavy artillery. It was a metal frame suspended between an automobile tractor and a trailer. The artillery piece was attached to the apparatus and then moved from one firing position to another, thus reducing wear on the carriage and damage to the gun. It was widely used with heavy artillery, but only one 30.5cm Beta-Gerät mortar battery was equipped with the apparatuses. Three apparatuses were needed to move one Beta-Gerät.





The 30.5 Beta i.R. howitzer of SKM Battery 6 in action on the Eastern Front in August 1915. (M. Romanych)

To mitigate the bombardment, the French partially evacuated their defenses, returned artillery fire, and even launched an attack to neutralize the main grouping of German artillery northeast of the fortress. However, the measures were inadequate, and on September 5, the VII Reserve Corps launched an assault. French troops resisted stubbornly and only the interval works of Bersillies and La Salmagne were seized. However, the next day, Fort Boussois and interval work Rocq fell to German infantry, creating a gap in the fortress ring. But the advance was suspended because the 21cm howitzers, having expended huge amounts of munitions at Liège and Namur, had now depleted their ammunition. It was up to the siege guns, which still had ammunition, to widen the gap in the fortress ring by reducing the adjacent forts. On the 7th, the 30.5cm and 42cm batteries, including KMK Battery 2's two Gamma howitzers which had recently emplaced along the rail line northwest of Maubeuge, fired their remaining rounds at Forts Leveau, Héronfontaine, and Cerfontaine, destroying them in a matter of hours. French resistance collapsed around midday when troops abandoned the rubble of Forts Sarts, Cerfontaine, and Leveau. With only two forts remaining in French hands, the fortress commander surrendered that evening. The Germans occupied the city the next day, September 8, after ten days of battle.

The German artillery at Maubeuge was now available for an attack on Paris. Yet on September 9, when the Allied counterattack on the Marne forced the German First and Second Armies to halt offensive operations and retreat to the north, the siege guns were sent to bombard Fortress Antwerp. Located far behind the German front line, Antwerp's fortifications consisted of some 35 forts and 15 secondary fortified works arranged in two concentric rings around the city. In addition to a large garrison of fortress troops,

the entire Belgian Army – six infantry divisions and a cavalry division – were defending the fortress.

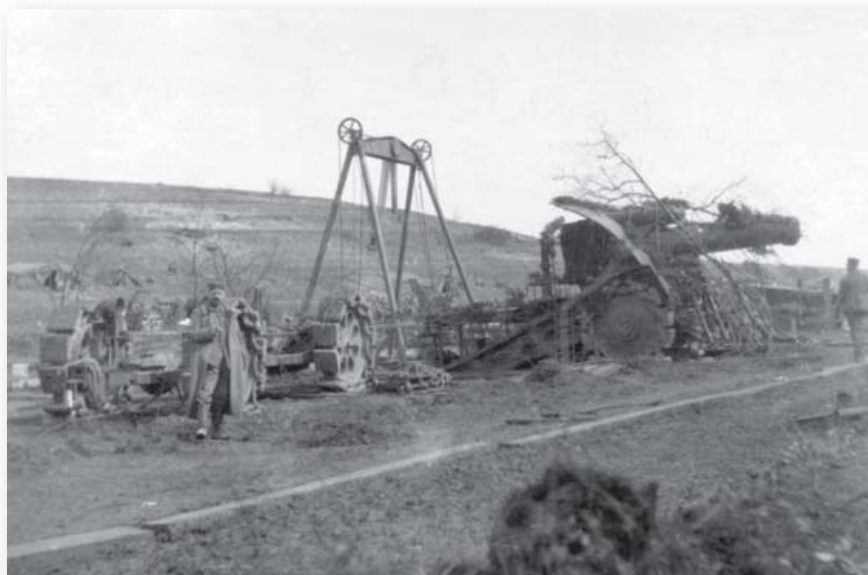
Four divisions of the German III Reserve Corps partially surrounded Antwerp on September 27. Infantry and artillery massed on the southern side of the fortress along a section centered on Fort Wavre-Sainte-Catherine. Siege artillery was four 42cm howitzers of KMK Batteries 2 and 3; five 30.5cm guns of SKM Batteries 1, 5, and 6; plus two batteries (four guns) of Skoda 30.5cm mortars, for a total of 13 pieces. It was the largest concentration of siege artillery in the war to date.

Bombardment commenced on the 28th with two 30.5cm Beta mortars of SKM Battery 1 and two 42cm Gammas of KMK Battery 2 shelling Fort Wavre-Sainte-Catherine, and two 30.5cm Beta 09 howitzers of SKM Battery 5 and one 30.5cm Beta i.R. of SKM Battery 6 shelling Fort Waelhem. The next day, the bombardment continued and expanded with four Skoda 30.5cm mortars opening fire on Fort Koningshooikt, and increased again on the 30th, with two 42cm M-Gerät howitzers of KMK Battery 3 shelling Fort Lierre. As the fortifications crumbled under the pounding from the siege guns, Belgian fortress artillery returned fire aggressively, almost hitting KMK Battery 3, but was unable to counter the German bombardment. Especially damaging to the forts were the 42cm projectiles, which easily crashed through the concrete roofs into the interior. The first fort (Wavre-Sainte-Catherine) fell on September 29, the second day of bombardment, after being catastrophically destroyed when a round from one of KMK Battery 2's Gamma howitzers hit a powder magazine and sparked an explosion that killed 60 soldiers. After the fall of Wavre-Sainte-Catherine, KMK Battery 2 shifted fire to reinforce the four Skoda mortars bombarding Fort Koningshooikt, which capitulated in less than a day. On October 2, the fifth day of bombardment, three more forts fell – Waelhem and Koningshooikt



Dummy Gamma howitzer built to deceive Serbian artillery observers during the shelling of the Semendria fortress in October 1915. As the war progressed, survivability of the siege guns became a great concern to the siege artillery batteries. (M. Romanych)

One of the eight M-Gerät howitzers employed during the German offensive at Verdun in February 1916. To avoid detection, siege guns were typically emplaced in wooded areas or, in the case of this howitzer, in low ground between hills. (M. Romanych)



were destroyed by magazine explosions and Lièrre was abandoned by its garrison after 42cm rounds destroyed three of its five armored turrets. German infantry advanced and seized the ruins, opening a 10-kilometer gap in the fortress' outer ring. With four forts now under German control, Belgian troops withdrew towards the inner fortification ring and the mobile siege gun batteries began moving to new positions to shell forts on either side of the gap. The bombardment was intense. Four Skoda mortars and KMK Battery 3 fired on Fort Kessel which, despite being among the most modern at Antwerp, quickly collapsed after a day of shelling, because of the damage wrought by the two 42cm M-Gerät howitzers. Its rapid fall permitted the four Skoda mortars and KMK Battery 3's M-Gerät howitzers to move forward and bombard Fort Broechem, which fell in two days. Meanwhile five 30.5cm guns of SKM Batteries 1, 5, and 6 shelled Fort Breendonk. It held out for three days, being the last fort to fall to artillery bombardment.

A camouflaged Gamma howitzer emplaced at Verdun in early 1916. In the background is the gantry crane for assembling the howitzer. Despite targeting by French counter-battery fire, no Gamma howitzers were hit. (M. Romanych)



The situation was hopeless for the Belgians. The outer fortress ring was broken and the older inner ring masonry fortifications could not stand up to the German siege guns. To avoid surrendering the army en masse, the Belgian Army, now reinforced by three brigades of British Naval troops, abandoned the fortress on October 7 and 8 and the city surrendered the next day. The siege ended after 12 days. The nine 30.5cm guns had fired 2,130 rounds while the four 42cm guns had fired 590 rounds; however, both the Germans and Allies attributed the rapid fall of the fortress to the devastating firepower of the 42cm howitzers, which destroyed five of the seven forts that were bombarded.

After Antwerp surrendered, KMK Battery 2 (two 42cm Gamma howitzers), SKM Batteries 5 (two 30.5cm Beta 09 howitzers) and 6 (one 30.5cm Beta i.R.), and two Skoda 30.5cm batteries (four mortars) were sent to support the German Fourth Army's attack to take the Channel ports. Because the Front



A 30.5 Beta i.R. howitzer under camouflage netting at Verdun. The netting was removed whenever the howitzer fired. (M. Romanych)

was stabilized in positional warfare, the siege guns were assigned to conventional artillery roles. The Skoda mortars periodically shelled Allied trenches while the longer-range 30.5cm and 42cm howitzers fired on “strategic targets” such as the cities of Nieuport and Dixmude, and Ypres. The effect was negligible and the Skoda batteries withdrew from the Western Front during the winter, followed by several of the other siege batteries as offensive operations ended and they were moved to the Eastern Front.

1915 – Eastern Front

Three new mobile siege artillery batteries were formed in 1915 – KMK Batteries 5 and 6, each with two M-Gerät howitzers; and SKM Battery 8 with the one 28cm L/14 i.R. – bringing the number of batteries to 13 and the number of fielded siege guns to 24 (11 42cm, 11 30.5cm, and two 28cm). About half of the siege artillery was employed on the Eastern Front.

The siege guns’ first action was to support the German Eighth Army’s attempt to take Osowiec in February. Located in northeastern Poland, the fortress consisted of a group of four large masonry forts sited on high ground surrounded by marshland. The attacking force was the reinforced 11th Landwehr Division. Bombardment began on February 25 by two battalions of 21cm howitzers and a battery of Skoda 30.5cm mortars. Two days later an additional Skoda mortar battery, SKM Batteries 6 (one 30.5cm Beta i.R. howitzer) and 8 (one 28cm L/14 i.R. howitzer), and KMK Battery 1 (two 42cm Gammas) joined in. Even with six siege guns shelling the fortifications, the bombardment was unsuccessful due to the siege batteries lacking observation and having to fire blindly at their targets, and also because of the effective Russian counter-battery fire which hit both Skoda batteries. After five days of shelling, the fortress had suffered little damage, the siege guns withdrew, and the attack ended in failure. The fortress was later captured in August without the aid of siege artillery.

Remains of an M-Gerät howitzer that suffered a catastrophic burst barrel at Verdun. The cause was faulty ammunition that prematurely exploded in either the breech or barrel. (M. Romanych)

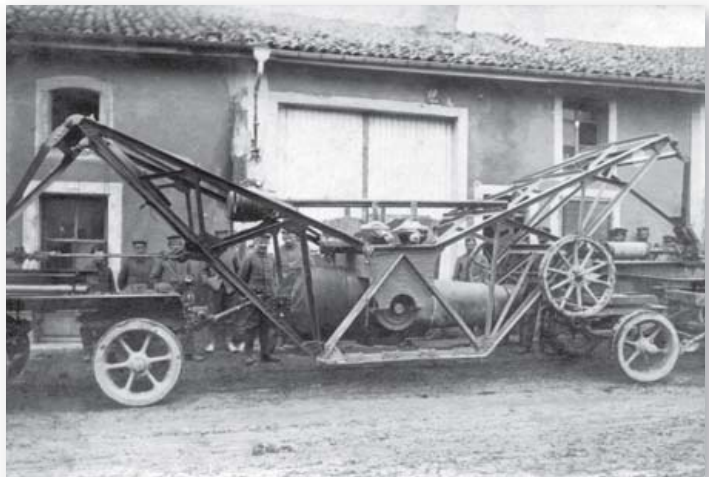


An M-Gerät howitzer during a lull in operations on the Western Front in 1917. In the last two years of the war, siege guns were employed much like traditional heavy artillery pieces to shell entrenchments or positions behind Allied lines. (M. Romanych)

The next siege artillery action was at the former Austrian fortress of Przemyśl, which had been captured two months earlier by the Russian Army on March 22 after a protracted five-month siege. The fortress had an outer ring of 35 modern forts and an inner ring of 27 older outdated fortified works. Defending were elements of six Russian divisions. On May 16, the Austrian X Corps mounted an infantry attack against the southwestern section of the fortress but failed to penetrate the defenses. Two weeks later, three corps of the German Eleventh Army arrived on the north side of the fortress and conducted a more methodical attack. This time, supported by three 30.5cm Skoda Mortar Batteries, SKM Battery 8 (one 28cm L/14 i.R. howitzer), and KMK Battery 6 (two 42cm M-Gerät howitzers), the fortress



fell in five days. Bombardment started on May 30 against four forts – X, Xa, XIa, and XI – which held a 4-kilometer sector of the fortress ring. After two days of shelling, the smaller Forts Xa and XIa were in ruins. German Infantry assaulted and seized these two forts plus Fort XI, breaking the outer ring. The Russians immediately launched a counterattack but failed to retake the forts, prompting the Russian commander to abandon the fortress to avoid defeat. German troops entered the city on June 3 and captured the last of Przemyśl's forts two days later.



A Lastenverteilergerät (load distribution apparatus) carrying the barrel of a 30.5cm Beta mortar. Only one Beta mortar battery was equipped with this apparatus. (M. Romanych)

In August, siege artillery played a critical role in the capture of two other Russian fortresses. In Lithuania, Fortress Kovno was attacked by the German XXXX Reserve Corps. The fortress consisted of eight outdated masonry forts, which ringed the city, being defended by a second-rate infantry division. As was the case with many Russian fortresses, Kovno was used as an artillery park or depot. Present were some 1,300 artillery pieces, although only 24 batteries (240 guns) of fortress artillery actively participated in the defense. Bombardment began on August 8 with SKM Batteries 1, 3, and 8 and KMK Batteries 1, 4, and 6 for a total of ten siege guns: three 42cm Gamma howitzers, two 42cm M-Gerät howitzers, four 30.5cm Beta mortars, and one 28cm L/14 i.R. howitzer. The siege batteries fired on three forts and several interval concrete battery positions along the west side of the fortress. Fire control was provided by artillery observers in airplanes and a fixed balloon. Although the bombardment was slow, it was effective, and on the 16th and 17th four heavily damaged forts were easily taken by infantry assault. The loss of the fortifications panicked the Russian garrison and the entire fortress was captured on August 18.

Meanwhile, in central Poland, the biggest siege of the Eastern Campaign took place at Novogeorgievsk, the Russian Army's largest and most important fortress. The fortifications consisted of an outer ring of 29 armored concrete forts surrounding an inner ring of older forts with a large citadel in the center. The fortress was garrisoned by four divisions and was expected to hold out for several months as the rest of the Russian Army withdrew from Poland. Noting the lessons of the Belgian forts in 1914, the Russians constructed extensive field fortifications in front of the forts to keep German infantry and artillery observers at distance.

As a prelude to the siege, the mobile siege guns of SKM Battery 6 (one 30.5cm Beta i.R.) and KMK Batteries 3 and 5 (four 42cm M-Gerät howitzers) reduced three detached fortifications east of Novogeorgievsk. The fortress was now isolated, and, on August 10, an *ad hoc* army group commanded by General von Beseler – the conqueror of Fortress Antwerp – surrounded Novogeorgievsk. The main attack was concentrated against a narrow sector on the north side of the fortress ring, in the same way Antwerp was attacked in 1914. Siege artillery consisted of SKM Battery 6, KMK Batteries 3 and 5, five Austrian 30.5cm Skoda mortar batteries, and one 42cm Skoda howitzer



A 30.5cm Beta-M-Gerät howitzer, or *schwere Kartaune*, on the Western Front. Two batteries were equipped with the howitzers in early 1918 and employed during the spring and summer offensives. (NARA)

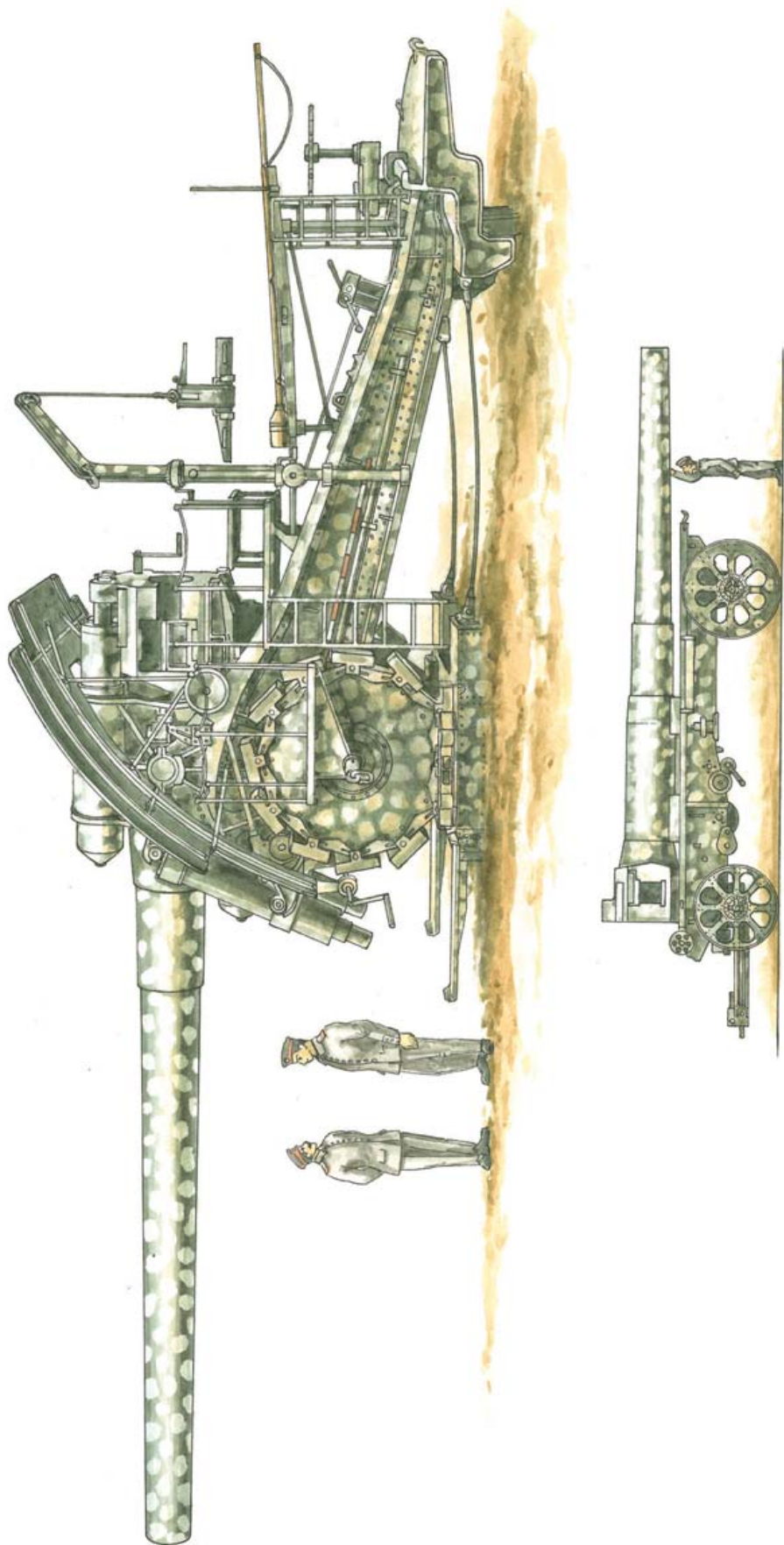
battery, for a total of 17 siege guns (six 42cm and 11 30.5cm guns). Munitions were limited to approximately 200 rounds available per battery.

The attack began on August 13 with a slow artillery bombardment of Forts XIV, XV, and XVI, and intensified over the next two days. Despite pounding by the siege guns, Russian troops stubbornly held and the forts had to be assaulted by infantry. On the morning of the 16th, German troops attacked Forts XV and XVI. During the fight for Fort XV, a 42cm shell hit a German infantry company, causing heavy casualties including the company commander. Nevertheless, Fort XV was captured later that day, breaking the fortress ring, although the Russians stubbornly held the adjacent forts and earthworks for two more days. On the 18th, Russian troops evacuated

G

THE LAST SIEGE GUN

The 30.5cm Beta-M-Gerät howitzer was the only major siege gun variant produced by the German Army during the war. Also called the *schwere Kartaune*, after a 15th century muzzle-loading siege gun, the Beta-M-Gerät was a 30.5cm L/30 barrel mated to an M-Gerät howitzer carriage. For a mobile siege gun, the barrel was massive, weighing 16 metric tons and measuring more than 9 meters long; almost twice the length of the original M-Gerät's L/12 barrel. The length and weight of the L/30 barrel required several changes to the M-Gerät carriage and recoil system, and the addition of two large equilibrators (spring cylinders) mounted to the front of the carriage as a counterbalance for barrel. Transport and assembly of the *schwere Kartaune* were similar to that of the M-Gerät. The most significant change was to the barrel transport wagon, which was lengthened and reinforced to carry the extra weight of the L/30 barrel, which increased the weight of the loaded wagon to 22 tons. Introduced to the field in early 1918, the *schwere Kartaune* was a failure because repeated barrel detonations forced the siege batteries to reduce the amount of propellant used during firing. Thus, the howitzer's range was shortened from 20,500 to 16,500 meters, which was not enough to outdistance Allied counter-battery fire. This technical limitation completely negated the operational purpose of having the longer barrel.



The Beta-M-Gerät howitzers were an engineering mistake because the large propellant charges needed for long-range, high-angle fire created too much gas pressure in the barrel, resulting in premature projectile detonations, the result of which can be seen here. (M. Romanych)



the outer ring of forts, allowing German infantry and artillery to advance inside the fortress ring. The next day, German infantry widened the gap in the outer ring of forts and captured three forts along the inner line and then the citadel, resulting in Russian capitulation by nightfall. Russia's largest fortress fell in only six days.

In reaction to Novogeorgievsk's sudden fall, the Russian Army lost confidence in its permanent fortifications. In its retreat from Poland, the army abandoned fortresses at Brest-Litovsk and Grodno so that large numbers of troops would not be trapped in a futile siege. In the case of Grodno, the Russian Tenth Army evacuated on September 3 as soon as German troops penetrated the outer defenses. The collapse was so quick that the siege artillery batteries – SKM Battery 1 and KMK Batteries 3, 5, and 6 – did not even have time to emplace.

The last major action for the siege artillery in 1915 was in the Serbian Campaign. To support the German Eleventh Army's crossing of the Danube River east of Belgrade, 43 batteries of heavy and siege artillery were assigned, among them KMK Batteries 1, 4, and 6 (four 42cm Gammas and two M-Gerät howitzers) and SKM Batteries 6 (one 30.5cm Beta i.R.) and 8 (one 28cm L/14 i.R.). Artillery fire began on October 6 and the river crossing was launched on the 7th. The siege batteries shelled Serbian strong points opposite the river crossing. KMK Battery 1's Gamma howitzers briefly shelled the 15th century medieval-style fortress of Semendria (Smederevo) fortress. Despite its age, the stout construction of the fortress held up well under the shelling and was not heavily damaged when it fell on the 11th.

With the advent of trench warfare on the Western Front, there were few notable actions involving siege artillery. In mid-February, at Verdun, KMK Battery 4's single Gamma howitzer fired 62 rounds at Forts Douaumont and Vaux, but caused no significant damage. Another action occurred on May 30 when the Gamma howitzers of KMK Battery 1 bombarded a railroad viaduct near Dannemarie (east of Belfort), which was serving as a supply line for the French Army. The battery fired 50 rounds at a range of 11,500 meters,

destroying eight of the viaduct's arches. From there, the battery was sent to shell the citadel at Arras and the city of Loos during June and July where, like other siege artillery batteries on the Western Front that year, it had no great effect on the fighting.

1916 – Verdun

At the beginning of the year, KMK Battery 7 was formed with two M-Gerät howitzers, bringing the total number of 42cm guns in service to 13, and the total number of siege guns to 26. The battery, along with all other 42cm batteries, was assigned to the Fifth Army for the offensive at Verdun. Twenty-four siege guns were present – five Gammas from KMK Batteries 1, 2, and 4, eight M-Gerät howitzers from KMK Batteries 3, 5, 6, and 7, nine 30.5cm guns from SKM Batteries 1, 2, 3, 4, and 6, and two 28cm howitzers from SKM Batteries 7 and 8. This was the largest concentration of German siege guns during the war and, as it turned out, also siege artillery's swan song.

Verdun was a fortress zone with a ring of some 17 forts and redoubts reinforced with numerous smaller secondary concrete fortifications. Among the strongest and most modern forts were Douaumont and Vaux, which coincidentally bore the brunt of the German attack. However, the battle for the forts was not decisive because the defending French Second Army did not base its defense on the fortifications.

The German offensive began on February 21 with an intense artillery barrage that slackened off after a few days and then continued in varying intensity for several months. The 42cm howitzers were tasked to suppress the fortress artillery and prevent Forts Douaumont, Vaux, Souville, and Moulainville from being used as assembly points for reserves, while the 28cm and 30.5cm guns fired on smaller, intermediate fortifications and various strategic points. Despite heavy shelling by the siege guns, the reinforced

In November 1918, two M-Gerät howitzers were handed over to US Army Forces at Spincourt near Verdun. In this view, from left to right, are two platform wagons, an equipment wagon, two barrel wagons, and two cradle and spade wagons. (NARA)



concrete and steel armor plate of the forts held up well. Damage to the forts' exterior surfaces was significant but the interiors remained serviceable because the 42cm projectiles did not penetrate the forts' reinforced concrete. Fort Moulainville, for example, remained in action even though it was hit by at least 339 42cm rounds. The two forts that were captured by the Germans – Douaumont and Vaux – fell to infantry assault, not artillery fire. The smaller intermediate fortifications, most of which were made of masonry, were destroyed by siege gun rounds.

Survivability of the siege guns was a major concern because French long-range counter-battery artillery sought out the siege batteries. In addition to normal camouflage measures, the batteries tried to avoid detection by limiting the number of rounds fired from a single position and the mobile batteries changed location whenever possible. Even so, in June, SKM Battery 6 was hit by French artillery fire, temporarily putting its 30.5cm Beta i.R. howitzer out of action.

More destructive to the siege artillery batteries were premature detonations of rounds in the barrels of the 42cm guns. The first incident occurred on the second day of the offensive when both M-Gerät howitzers of KMK Battery 7 were destroyed. Seeking a cause for the detonations, a team of munitions officers inspected all stocks of 42cm projectiles and shell casings, yet in subsequent weeks the barrel detonations continued – one M-Gerät in KMK Batteries 5 and 6, and one Gamma howitzer in KMK Batteries 2, 8, and 9 – for a total of seven 42cm guns damaged or destroyed. In contrast, only one 30.5cm Beta mortar had a round detonate in the barrel. After much investigation, the cause was found to be faulty rounds.

Beginning in April and continuing through the summer, six new siege artillery batteries were formed by taking a gun and personnel from the existing batteries and forming them into new batteries. Thus, KMK Batteries 1, 2, and 3 provided guns to form KMK Batteries 8 (two Gammas), 9 (one Gamma), 10 (one M-Gerät), and 11 (one Gamma), and SKM Batteries 1 and 2 provided guns to SKM Batteries 9 and 10. Even so, the overall number of siege artillery batteries did not increase greatly because batteries that lost their guns to barrel detonations were re-equipped with 12cm or 15cm cannons, re-designated *schwere Kanonen* (heavy cannons) battery, and employed as long-range artillery.

In July, after the German offensive ended, a number of siege artillery batteries were reassigned from Verdun to other operations. First, several batteries were sent to the Somme Front in response to the British–French offensive there, then several others were sent to support the campaign against Romania. In both operations, the impact of the siege artillery was negligible. By September only six siege batteries with seven guns remained at Verdun: KMK Batteries 3, 4, and 6 and SKM Batteries 1, 2, and 5.

1917–18 – Decline

During the last two years of the war, siege guns continued to serve on both the Western and Eastern fronts even though their utility had passed. With no permanent fortifications to bombard, siege artillery batteries were assigned other targets for which they were ill suited, such as towns or field fortifications. The siege guns' utility was also greatly diminished because their range, even when firing the lighter short projectiles, was far less than that of Allied counter-battery artillery.

Barrel detonations and Allied counter-battery fire continued to plague the siege guns, especially KMK Battery 10, which experienced a series of calamities. In May 1917, while emplaced on the Chemin des Dames, the battery was hit by French artillery, killing two crew members and wounding seven. Then, in August, while shelling Nieuport from a position on the coast near Ostend, a round malfunctioned and detonated about 150–200 meters in front of one of the battery's M-Gerät howitzers. Finally, the battery was spotted by British aircraft and shelled for two and a half hours by warships in the English Channel. With one howitzer destroyed and the other put out of service, the battery was re-armed with Russian 12cm guns until it received new long-barreled 30.5cm Beta-M-Gerät howitzers in early 1918.

The 30.5cm Beta-M-Gerät howitzer was developed in late 1917 when the APK decided to increase the range of the siege artillery by mounting a long-barrel gun tube on the M-Gerät carriage. To avoid the barrel detonation problems that plagued the 42cm guns, a 30.5cm L/30 naval-style cannon barrel was selected. To accommodate the barrel, which was more than 9 meters long, several changes were made to the M-Gerät carriage and recoil system. Krupp performed the modifications, which took one to two months per gun. Twelve barrels were manufactured. The new gun weighed 47 metric tons, three more than the M-Gerät, and had a maximum range of 20,500 meters. The howitzer was designated the 30.5cm Beta-M-Gerät and was also called the *schwere Kartaune*. Later, Gamma howitzers were considered for an even longer 30.5cm L/35 barrel, but none were converted.

Two M-Gerät barrel wagons and a carriage wagon in the possession of the US Army at Spincourt. Like most late-war German artillery, the equipment is painted in a "dapple" camouflage pattern. (NARA)



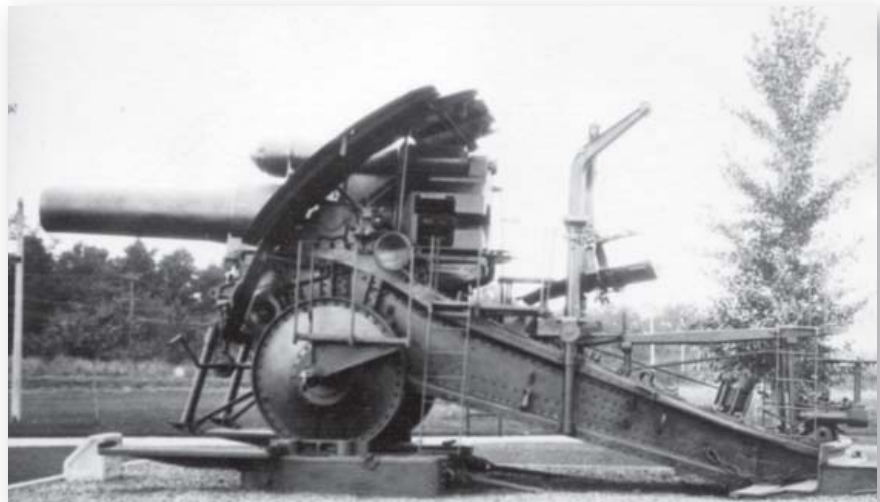
By early 1918, two batteries – KMK Batteries 8 and 10 – were each equipped with two Beta-M-Gerät howitzers. However, soon after fielding, the guns proved ineffective, with three of the four howitzers suffering barrel bursts because the ammunition was not suited to the high velocity needed for high-angle fire. The solution was to limit the size of the propellant charges, which in turn reduced the range of the Beta-M-Gerät to 16,500 meters, defeating the purpose of even having the longer-barreled howitzer.

For the spring offensives, ten siege artillery batteries with a total of 17 28cm, 30.5cm, and 42cm guns saw action. In Flanders, KMK Battery 8 was assigned to the Sixth Army, and on the Somme KMK Batteries 4 and 5 and SKM Batteries 1 and 8 were assigned to the Seventeenth Army; KMK Battery 6, SKM Batteries 5 and 7 to the Second Army; and KMK Battery 3 and SKM Battery 9 to the Eighteenth Army. In addition, several batteries of Austro-Hungarian 30.5cm and 42cm siege guns were brought in for reinforcement.

The siege guns' involvement was of little consequence, even when used in novel ways. For example, in early June SKM Battery 9 shelled a railway tunnel in the Champagne region where the French Army was sheltering reserve troops. Copying an earlier French attack, in which a 40cm shell from a railway gun penetrated the tunnel and killed more than 400 German soldiers, the battery's two 30.5cm Beta-Gerät mortars fired 150 shells over several days, first shelling the entry and exit of the tunnel, and then shelling the length of the tunnel; however, no French casualties were reported.

In July, during the German Army's last offensive of the war, even more siege artillery was put into action. Fourteen batteries with 24 guns were allocated to the Seventh Army in the Marne region (KMK Batteries 5 and 6, and SKM Batteries 3 and 6), and the First Army around Reims (KMK Batteries 3, 4, 8, and 10, and SKM Batteries 1, 2, 5, 7, 8, and 9). Again, the siege guns had little effect on the outcome of battle, although KMK Battery 10's Beta-M-Gerät howitzers shelled Fort Pompelle outside Reims; thus being the last siege battery to fire on a fort in the war.

In the fall of 1918, nine siege gun batteries exchanged their guns for long-range field howitzers and were assigned to Landwehr artillery battalions.



One of the M-Gerät howitzers surrendered by the German Army at Verdun was put on display at the US Army's Aberdeen Proving Ground. The howitzer was scrapped in 1943. (NARA)

This reorganization left only five batteries of siege guns in the field at the war's end: KMK Battery 4 with one Gamma howitzer, Battery 5 with two M-Gerät howitzers, Battery 8 with two Beta-M-Gerät howitzers, SKM Battery 3 with two Beta-M-Gerät mortars, and Battery 5 with two Beta-Gerät 09 howitzers.

Aftermath of World War I

Only three siege guns are known to have survived the war. Two 42cm M-Gerät howitzers from KMK Battery 5 were handed over at Spincourt near Verdun to US Army Expeditionary Forces in November 1918. Both howitzers were shipped to the United States in 1920, where they were evaluated and then displayed at Aberdeen Proving Ground. One howitzer was assembled and put on static display while the other was left unassembled on its five transport wagons. Both guns were eventually scrapped, one in 1943, the other in the early 1950s. A source of confusion about surviving M-Gerät howitzers was a full-scale wooden model built in 1932 by Emil Cherubin, who served with an M-Gerät battery in World War I. This replica toured Germany, and is quite commonly found on postcards.

The one remaining 42cm Gamma howitzer was disassembled at Krupp's Meppen proving ground and hidden from the Allied Control Commission. The howitzer was reassembled in the late 1930s and used in 1940 against the Belgian fortress of Liège and the Maginot Line, and then in 1942 at the siege of Sevastopol. Later the howitzer was sent to bombard the Russian Naval Fortress of Kronstadt, but it never fired and returned to Germany at the end of the year. Its fate thereafter is unknown.

None of the siege guns exist today. Remaining vestiges include projectiles and shell casings in several European museums, and a 1/5-scale builder's model of an M-Gerät howitzer in the Musée de l'Armée at Les Invalides, Paris. Yet the siege artillery's legacy still lives in the ruins of the fortifications in Belgium, France, and Poland.

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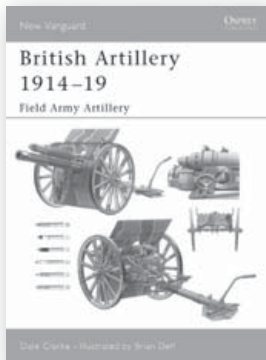
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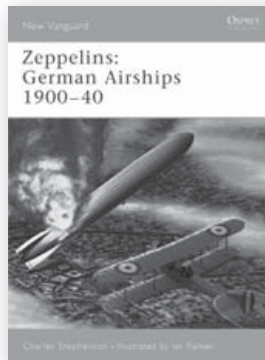
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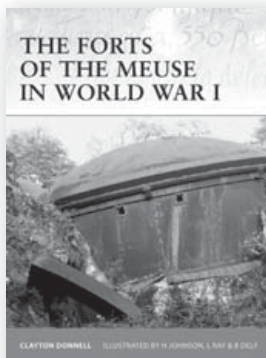
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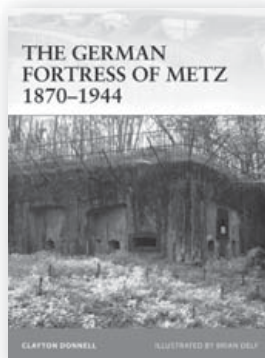
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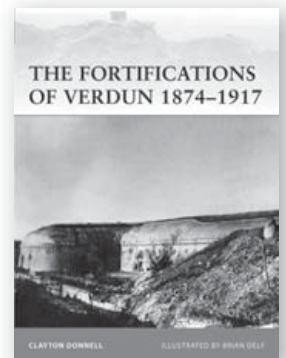
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EDITOR'S NOTE

For ease of comparison please refer to the following conversion table:

1 mile = 1.6km
1yd = 0.9m
1ft = 0.3m
1in = 2.54cm/25.4mm
1 gallon (Imperial) = 4.5 litres
1lb = 0.45kg